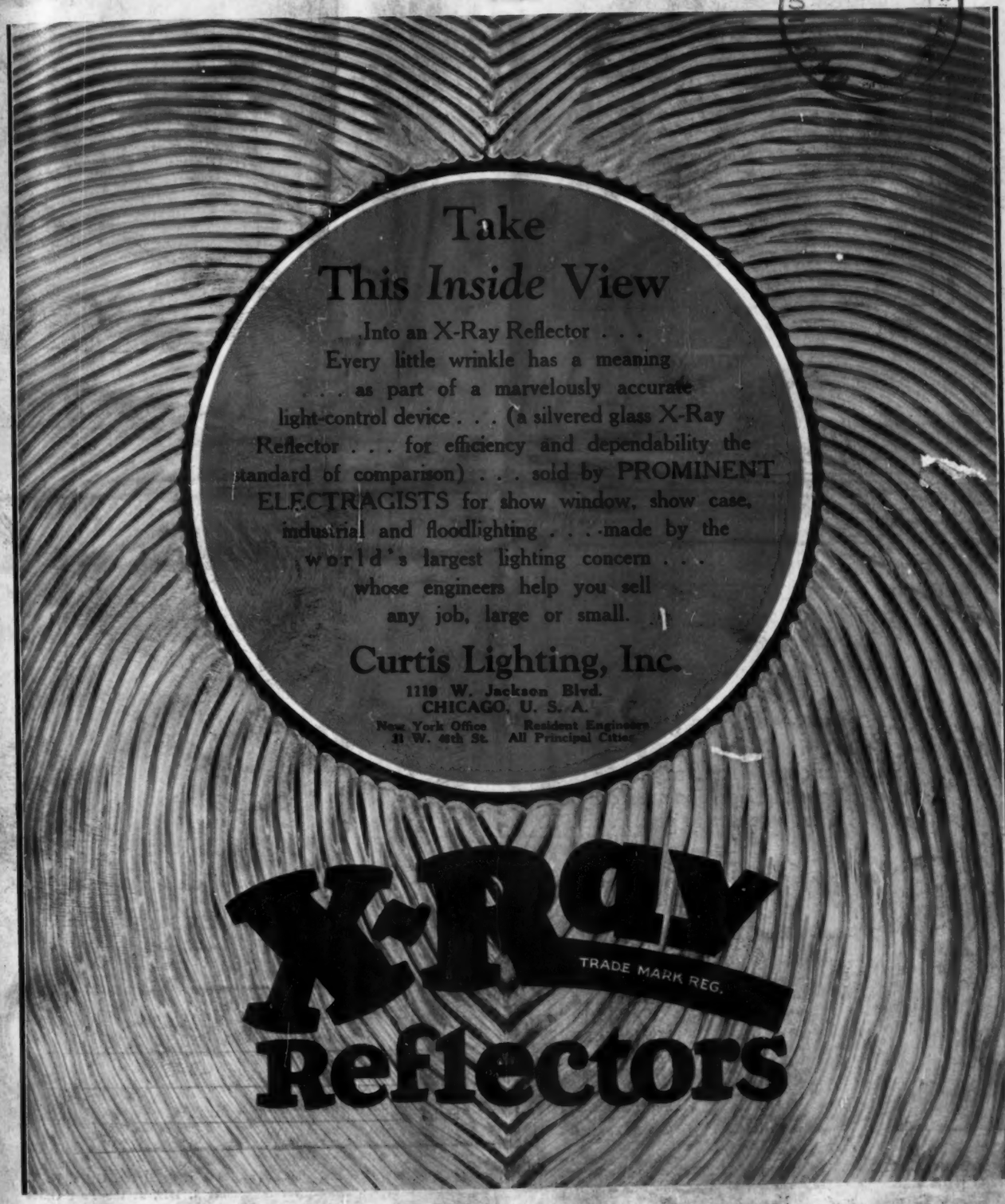
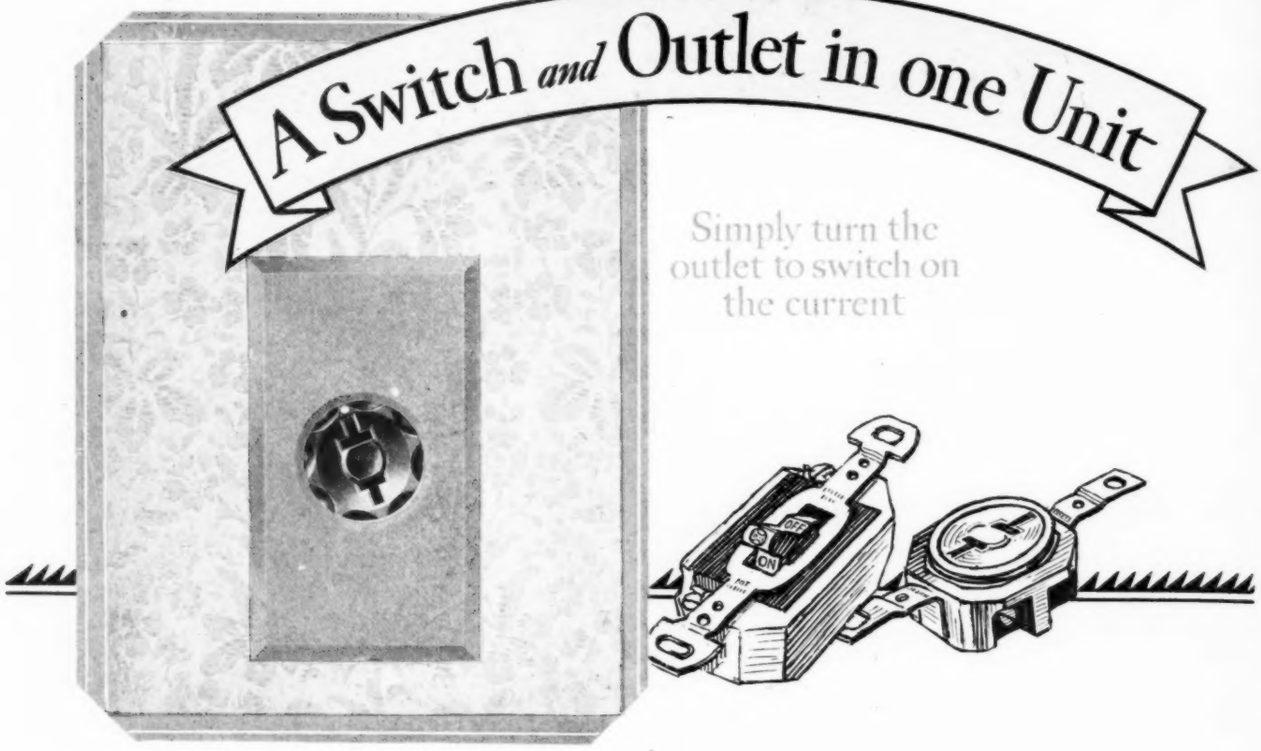
The Electragist

TRADE MARK REG. U.S. PAT. OFFICE

Vol. 27, No. 12 — Association of Electragists INTERNATIONAL — OCTOBER, 1928


Take
This *Inside* View
Into an X-Ray Reflector . . .
Every little wrinkle has a meaning
. . . as part of a marvelously accurate
light-control device . . . (a silvered glass X-Ray
Reflector . . . for efficiency and dependability the
standard of comparison) . . . sold by PROMINENT
ELECTRAGISTS for show window, show case,
industrial and floodlighting . . . made by the
world's largest lighting concern . . .
whose engineers help you sell
any job, large or small.
Curtis Lighting, Inc.
1119 W. Jackson Blvd.
CHICAGO, U. S. A.
New York Office
11 W. 42th St.
Resident Engineers
All Principal Cities
X-Ray
TRADE MARK REG.
Reflectors

A Switch *and* Outlet in one Unit



Provide the convenience of two devices by installing one . . . *a Switch-Tap*

YOUR customers will want the double convenience of the Hubbell Switch-Tap. In one device it combines both switch and outlet. A simple turn of the "finger-grooved" outlet switches on the lights . . . and live Te-Slots offer a place at just the right height to plug-in toaster, iron, vibrator, or other electrical appliances.

One device to wire saves time and materials

To install the Switch-Tap—just run one BX... mount and wire one device . . . snap on a plate. No looping, less skinning. You need only one single outlet box, one single plate, one BX.

Plate exactly matches any wall or wood finish

Covered with a Hubbell Bakelite Screwless Plate . . . which you order to exactly match the finish of wall or woodwork . . . a Switch-Tap blends with the decorative treatment of any room.

The Switch-Tap fills a need. It is both handy and handsome. And you make a larger profit on its installation. Full details should interest you—the coupon will bring them.

HARVEY HUBBELL, Incorporated
BRIDGEPORT : CONNECTICUT

HUBBELL

HUBBELL *Switch-Taps*

Mail coupon to our nearest office
Bridgeport, Conn., Main Office

Boston, Mass
176 Federal St.

Atlanta, Georgia
138 Marietta St.
H. C. Biglin

Baltimore, Md.
216 E. Lexington St.

New York City, N. Y.
30 East 42nd St.

Chicago, Illinois
318 W. Washington St.

Denver, Colo.
1109 Broadway
The Sales Service Co.

Philadelphia, Pa.
Fifth St.—
Philadelphia Bourse
(Exhibition Dept.)

San Francisco, Cal.
390 Fourth St.
Garnett Young & Co.

Please send information on "Switch-Taps"

Name _____

Address _____

City and State _____

E. 10—28

THE ELECTRAGIST, October, 1928, Vol. 27, No. 12, $2.00 per year, 20 cents a copy. Published monthly at 100 Liberty Street, Utica, N. Y. Association of Electragists—International, 15 West 37th St., New York, N. Y. Entered as second class matter September 1, 1919, at the Post Office at Utica, N. Y., under the act of March 3, 1879.

Noark

Nublade Switch

"I'll use this for my main entrance switch"

It's got everything a service entrance unit should have—

A good, rugged cabinet with plenty of knockouts—

Accessible terminals and abundant wiring space—

A separate block for each pole, with an assembly of switch-blade, contact and fuse clips.

Perfect alignment. Greatest area of contact.

Makes and breaks at an angle.

Blade shaped to bring maximum amount of metal at point of contact to minimize arc and dissipate heat.

External safety switch with spring-actuated, quick-break mechanism.

And it's a Noark Product—just the thing to go along with Noark Meter Service Switches.

COLT'S PATENT FIRE ARMS MFG. CO.
ELECTRICAL DIVISION
HARTFORD, CONNECTICUT, U. S. A.
NEW YORK BOSTON PHILADELPHIA PITTSBURGH CHICAGO SAN FRANCISCO 33-N-20

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NATIONAL
ELECTRIC PRODUCTS
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WIRES AND CABLES

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OR *Every*
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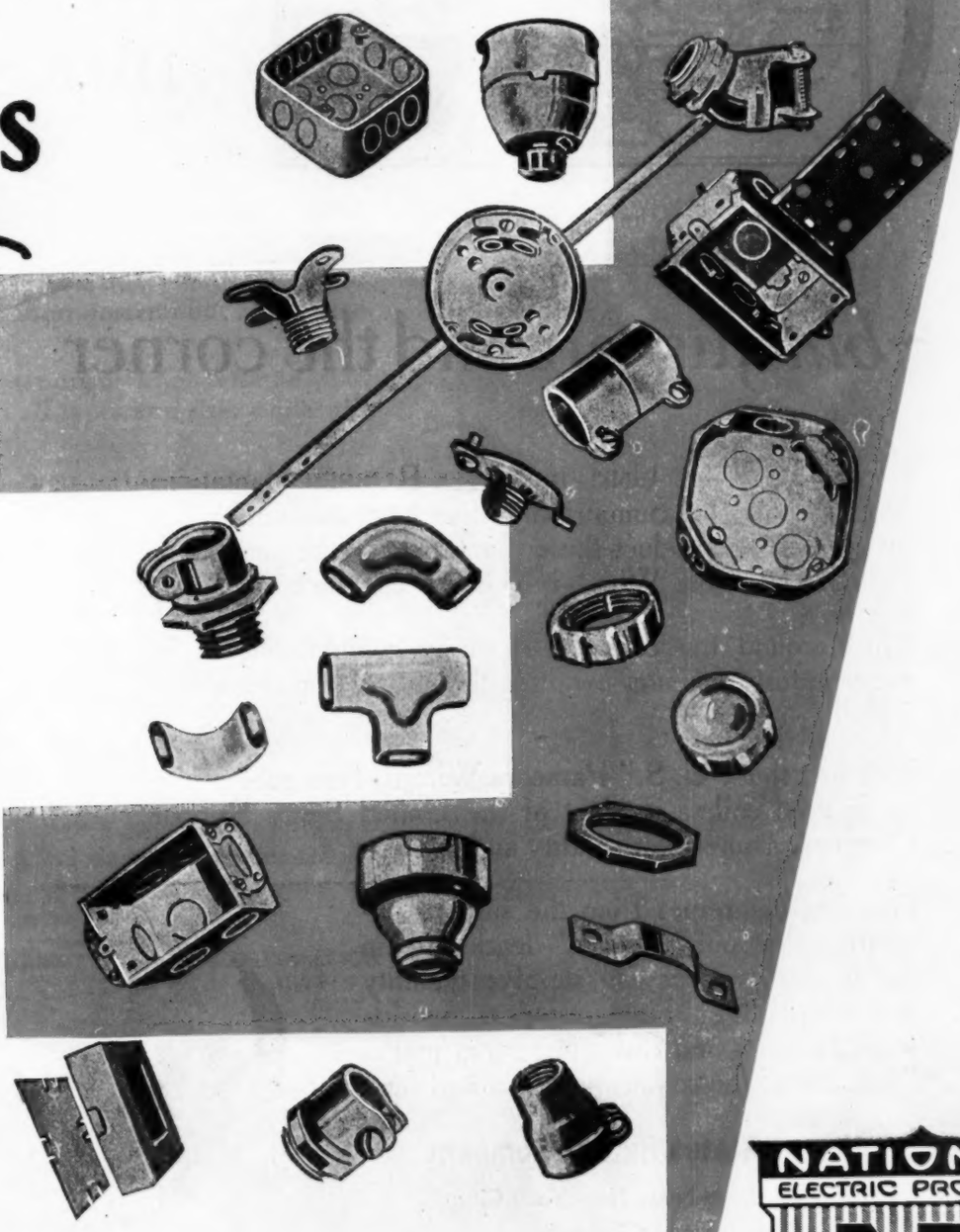
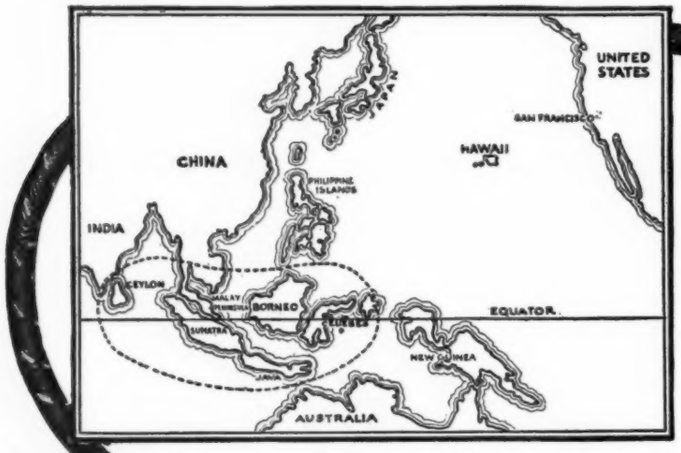


ducts Corporation
ding Division

NATIONAL
ELECTRIC PRODUCTS
WIRING 6 SYSTEMS
WIRES AND CABLES

ELECTRIC



10 thousand miles away

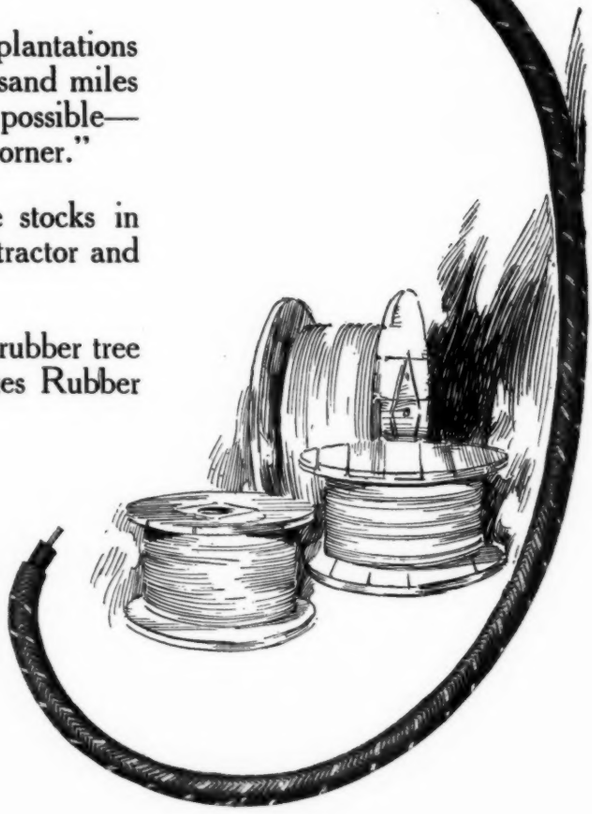
~*but* just around the corner

THE UNITED STATES RUBBER plantations in Sumatra are almost ten thousand miles away, but the product these plantations make possible—"U. S." Paracore Wire—is "just around the corner."

"Just around the corner"—meaning complete stocks in every industrial center awaiting the call of contractor and jobber.

The fact that "U. S." Paracore Wire is, from rubber tree to finished coil, a product of the United States Rubber Company assures both quality and quantity.

Quality that comes from the superior insulation that only "U. S." leadership in the field of rubber can supply; quantity that results from huge resources, world-wide facilities and distribution that makes "just around the corner" service a real fact.



United States Rubber Company

1790 Broadway, New York City

Branches in every industrial center.

"U.S." PARACORE REG. U.S. PAT. OFF. **WIRES & CABLES**

Standards that Surpass

Always Specify "U. S." Friction Tape and "U. S." Splicing Compound

AMERICAN BROWN BOVERI
acquires Packard TRANSFORMERS
for manufacture at Camden

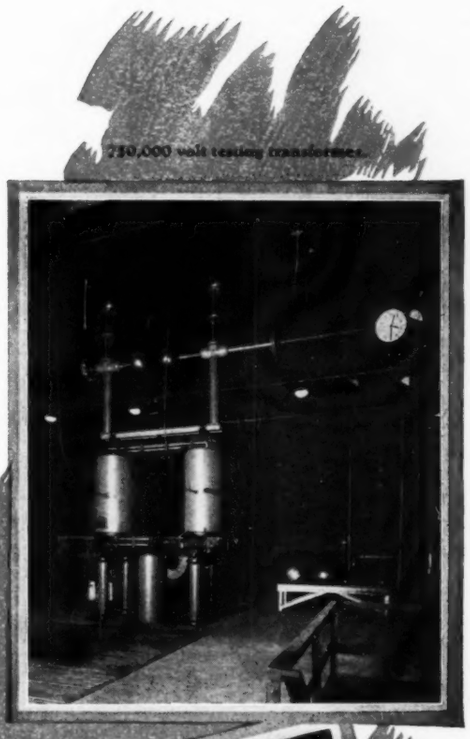
THE transformer division of The Packard Electric Company, Warren, Ohio, has been purchased in its entirety by American Brown Boveri Electric Corporation.

The wide range of Packard Transformers comprises power, distribution, instrument and metering types.

These transformers nationally known for 38 years will be continued in all types and sizes under the established trademark Packard.

Manufacturing and engineering facilities will be consolidated with those of American Brown Boveri at the Camden, N. J. plant.

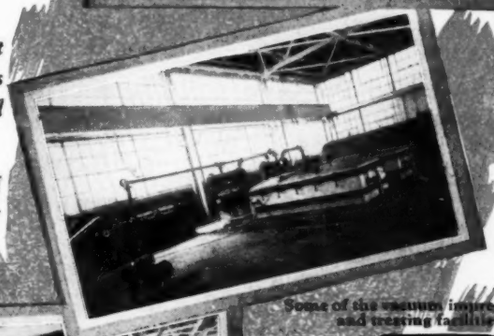
The types and sizes of transformers represented by the Packard Division when added to the high tension, large capacity transformers now manufactured by American Brown Boveri at Camden, N. J., will provide a line wide enough in scope to fill any transformer requirement.



750,000 volt testing transformer.

Photographs on these pages show a portion of the facilities at Camden for the production and testing of all classes and sizes of transformers including power, distribution, instrument and metering types.

AMERICAN BROWN BOVERI ELECTRIC CORPORATION
GRAYBAR BLDG., N. Y. CAMDEN, N. J.



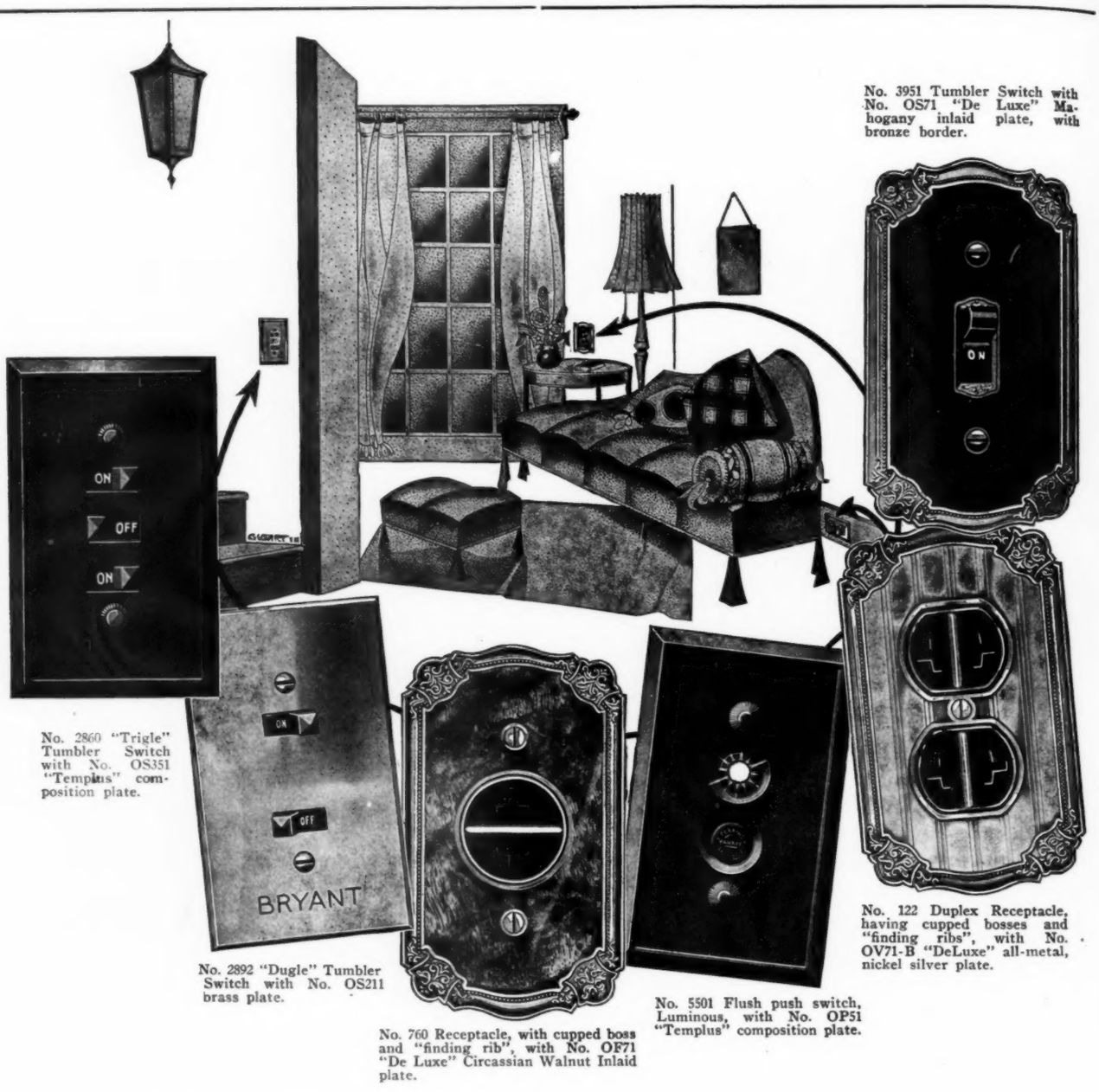
Some of the vacuum impregnating and treating facilities.

ABB

Drying ovens and vacuum treating apparatus sufficient in size to accommodate cores of the largest, high voltage transformers.

Japanning and baking equipment for core plate varnish treatment of laminations.

You are invited to visit our plant in order to acquaint yourself more fully with our manufacturing facilities and methods of construction.



No. 3951 Tumbler Switch with No. OS71 "De Luxe" Mahogany inlaid plate, with bronze border.

No. 2860 "Trigle" Tumbler Switch with No. OS351 "Templus" composition plate.

No. 2892 "Dugle" Tumbler Switch with No. OS211 brass plate.

No. 760 Receptacle, with cupped boss and "finding rib", with No. OF71 "De Luxe" Circassian Walnut Inlaid plate.

No. 5501 Flush push switch, Luminous, with No. OP51 "Templus" composition plate.

No. 122 Duplex Receptacle, having cupped bosses and "finding ribs", with No. OV71-B "DeLuxe" all-metal, nickel silver plate.

this glimpse of a room corner

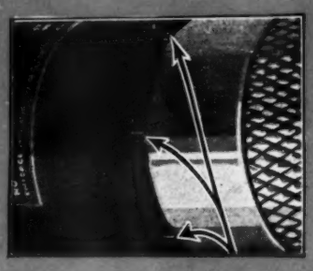
in a modern house shows Bryant switch and receptacle installations. The residence, office or factory, completely Bryant equipped has wiring devices of reliability that assure long service and satisfaction.

"From left to right"--the devices shown above are: A "Trigle" switch, with "Templus" composition plate, controlling lights in hallway and porch; a "Dugle" switch with brass plate, for bedroom and closet; a single convenience receptacle, with "De-Luxe" Circassian Walnut inlaid plate, for wall panel in dining room; a push button switch at the entrance to all bedrooms: a duplex convenience receptacle, with "De-Luxe" all metal plate,--two or three for each important room; and a tumbler switch with "De Luxe" mahogany inlaid plate, (indications on handle) for each entrance, hallways, dining room, library, living room, sun parlor, kitchen and basement.

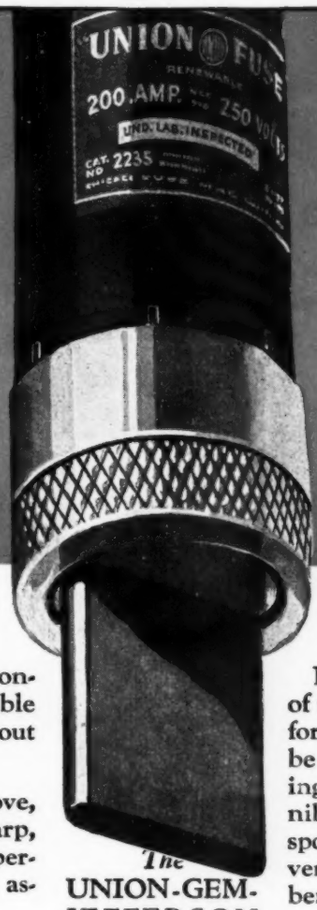
THE BRYANT ELECTRIC COMPANY, BRIDGEPORT, CONN., U. S. A.

New York - Philadelphia - Chicago - San Francisco

Good as New—Blow-out After Blow-out



Close-up of knife-blade type, showing scientifically proportioned vents which provide for the escape of gasses. Molten fuse metal is not forced into end cap threads.



Showing how fusible link of knife-blade type is notched at both ends to permit quick and easy renewal by slightly loosening the studs.

SIMPLIFIED design and rugged construction keep Union Renewable Fuses as serviceable as new—blow-out after blow-out.

In the knife-blade type, shown above, a rugged fibre bar which will not warp, holds the knife-blade assembly in perfect alignment, and assures easy assembly of the fuse.

The extra heavy and tough grey horn fibre case is vented by an exclusive method. Vents are in the fibre shell and are scientifically proportioned to relieve the pressure generated when the fusible element blows. Molten metal is not forced into end cap threads.

In addition to these marked advantages, which insure a new fuse for the price of a link, the extreme simplicity of design and fewer parts make renewals quick and easy.

The
UNION-GEM-JEFFERSON
Line is Sold Through Wholesalers

FREE
Fuse Chart and Catalog
Chart tells at a glance proper size fuse for any equipment. New Catalog No. 33 gives complete information on fuses and conduit fittings.

In the knife-blade type, both ends of the fusible link are notched—therefore the studs that hold the link need be loosened only slightly when making renewal. In the ferrule type two nibs on the washers fit into corresponding holes in the body and prevent the link from twisting. Links are bent at one end to make renewal easy.

The fusible links are accurately rated and designed to insure maximum safety of operation under the most severe conditions.

The dependability, the savings in time and money, are a few of the reasons why Union Renewable Fuses are the choice of leading electricians everywhere.

Chicago-Jefferson Fuse & Electric Co.
1503 West 15th Street Chicago, Illinois

UNION FUSES

Because they are worth more they really cost less

In keeping with the times the Condit type N-4 combines simplicity, efficiency and lasting dependability in a way that makes it the logical choice for a wide variety of industrial applications.

It comes manually operated with or without thermal cutouts or with push button control with or without thermal relays for overload time-lag protection. Its price is surprisingly low.

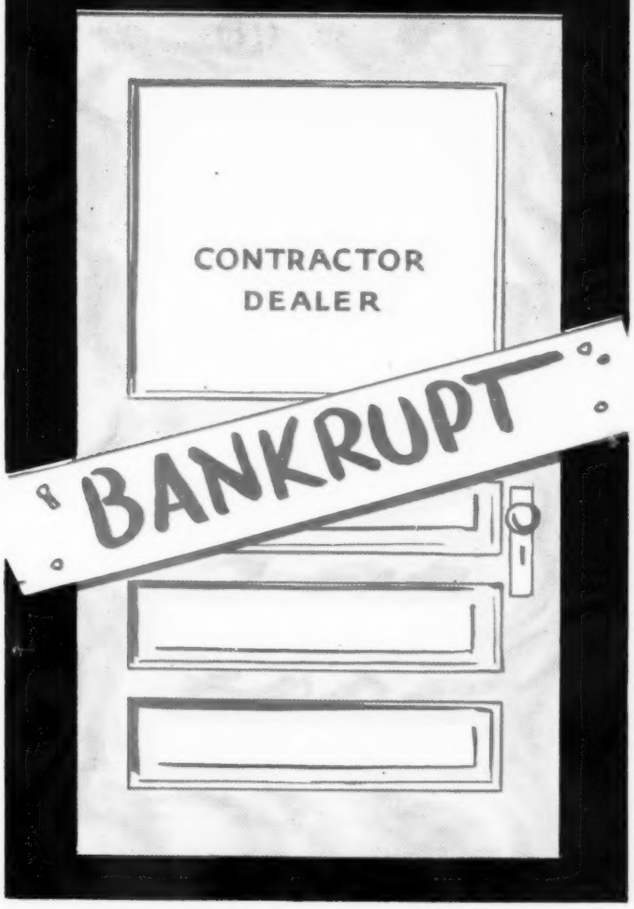
CONDIT ELECTRICAL MFG. CORPORATION
Manufacturers of Electrical Protective Devices
BOSTON, MASS.
Northern Electric Company
LIMITED
Distributor for the Dominion of Canada

SPECIFICATIONS: ***3 or 4 pole; standard sizes 30 amperes, 600 volts. For small motors, 5 HP or less,—600 volts. Approved by Underwriters.***

CONDIT

2124

What's wrong with the ELECTRICAL BUSINESS?



HENDERSON-HAZEL CORPORATION
5005 Euclid Ave., Cleveland, Ohio
In Canada: Henderson Business Service, Ltd., Brantford

PRICE CUTTING? VOLUME? COMPETITION? MAN POWER? CAPITAL?

All of the above problems are undoubtedly factors but the basis of success in the Contracting and Retail Business is correct prices and every branch of the Electrical Industry suffers if the prices received by the Contractor-Dealer for jobs installed and goods sold over the counter are not sufficient to cover overhead expense and a fair profit.

Over 1000 Contractor Dealers Are Making Money

In almost every state Contractor-Dealers are using the NATIONAL ELECTRICAL RESALE PRICE SERVICE and are making money. Their pricing is on an intelligent basis—they are assured of a profit on every transaction—their collections have improved—customer confidence is created—in fact our Price Book is their Bible.

Is This Worth 20 Cents Per Day?

If you are not satisfied with the profits from your business at the present time but are concerned with the future, why not investigate this profit-producing and time-saving Service? We will gladly mail you full particulars without obligation, but as the Service is furnished only to those engaged in the Electrical Business, please attach your letter-head to the coupon below.

Guarantees Profits

Saves Time

Investigate

HENDERSON-HAZEL CORPORATION,
5005 Euclid Ave., Cleveland, Ohio.
Without obligation please send us full information about the NATIONAL ELECTRICAL RESALE PRICE SERVICE.

Name .....
Street Address .....
City or Town .....
State .....

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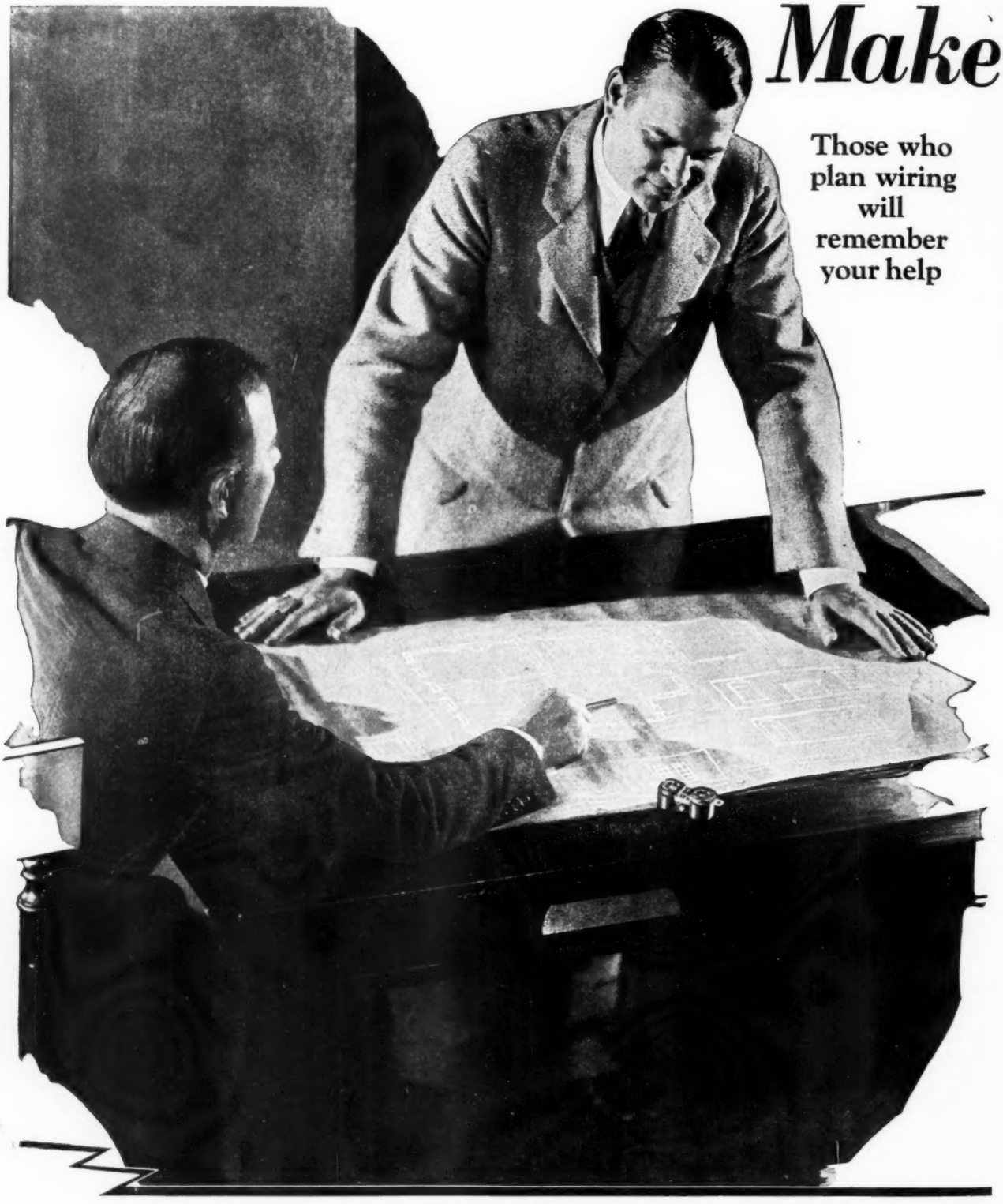


Make

Those who plan wiring will remember your help

The switch mechanism of the C-H Porcelain Socket is strong and positive. The construction throughout is rugged to withstand years of service. A single assembly screw saves time in wiring and interchange of caps and bases is possible. Made in the key, keyless, push-button and pull-chain types. Approved by the Underwriters.

C-H Push-Button Switch for flush mounting. Made in single-pole, double-pole, and 3-way types. Handles all types of lamps including gas filled bulbs. Shallow construction and large binding posts make installation easy and quick. Approved by the Underwriters.

SELL COMPLETE CONVENIENCE

your knowledge sell more wiring jobs . . .

Before wiring plans are settled, co-operate with your experience, to assure complete wiring and a better job

NOW-A-DAYS, the man who sells any product is expected to be an expert in its uses . . . From lawn-mowers to motor trucks, the buyer looks to the seller for pointers on how to get the most satisfaction, service, or profit out of his investment.

C-H Duplex Receptacles are small and shallow—designed for easy handling and quick wiring. Parallel slots are polarized. Contacts are heavy one piece phosphor bronze doubled to insure firm contact at all times regardless of length of service and to prevent stubbing. Approved by the Underwriters.

Use this modern sales trend in your business. Your specialized experience has made you the logical source of electrical wiring knowledge in your locality—a source which the architect, builder, or owner, whoever plans the home, will gladly use—if you make him think of you.

Before the wiring plans are settled, offer the results of your experience—your knowledge of how wiring can make the home more attractive, and thus more readily salable at a good price—as well as a more satisfying place to live.

It will pay you two ways. A completely wired home gives you the maximum profits on the job because more material is used. And a satisfied customer will remember you—give you first chance on the next job.

To safeguard the goodwill thus built up, always install C-H Wiring Devices—a complete line with an unquestioned reputation dating back over a quarter century behind it.

You will need the latest Cutler-Hammer Catalog describing a quality wiring device for every need. Write for the Catalog and stock up from your jobber.

C-H Wiring Devices are sold through jobbers

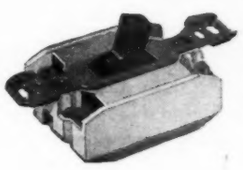
The CUTLER-HAMMER Mfg. Co.

Pioneer Manufacturers of Electrical Apparatus

1258 St. Paul Avenue MILWAUKEE, WISCONSIN

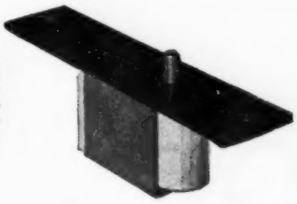
CUTLER HAMMER

MODERN WIRING C-H *NECESSITIES*



C-H Toggle Flush Switches handle all lamps including gas-filled bulbs. Built shallow, they are convenient to install in any standard box. Made in single-pole, double-pole, 3-way and 4-way types. Approved by Underwriters.

C-H Automatic Door Switch can be installed in any door jamb. Light is turned on automatically when the door is opened. Especially convenient for lighting closets. Designed to fit in any type of box and to use any type of wire including "Romex." Approved by the Underwriters.



— BUILD GOOD WILL

(3204)

BETTER TIME SWITCHES
—*motor-operated*

Here is shown one of the General Electric time switches together with its unique time-keeping element, a little synchronous motor. It is the motor-operated feature that gives G-E time switches their unquestioned superiority. Besides, they are exceptionally well built.

G-E time switches require no winding, as they have no clock movement. The little motor runs in step with the power supply, which assures high accuracy and reliable switching.

If you have had experience with faulty or inaccurate time-switch operation, take advantage of these improvements. Specify G-E motor-operated switches for future work.

Available through G-E distributors. A postal card or letter to your G-E distributor or the nearest G-E office will bring full information.

The G-E 20-amp. time switch, type T-9

A 10-amp. G-E time switch, type T-8, is also manufactured. Both are for use only on a-c. circuits of regulated frequency.

The time-keeping element, a synchronous motor

The reliability of a motor-operated timing mechanism is shown by the success of the Telechron, a widely used electric time keeper. Central station companies establish important billing rates on the basis of demand measured by G-E meters that are synchronous-motor operated—the same as these G-E time switches.

621-4

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Use the Right Motor

Whatever you need in motors . . . mechanical simplicity; automatic starting; high efficiency in starting and in running; adjustable speed; quietness; regulation of power-factor; protection from fumes or dust . . . Wagner makes every commercial type of alternating current motor.

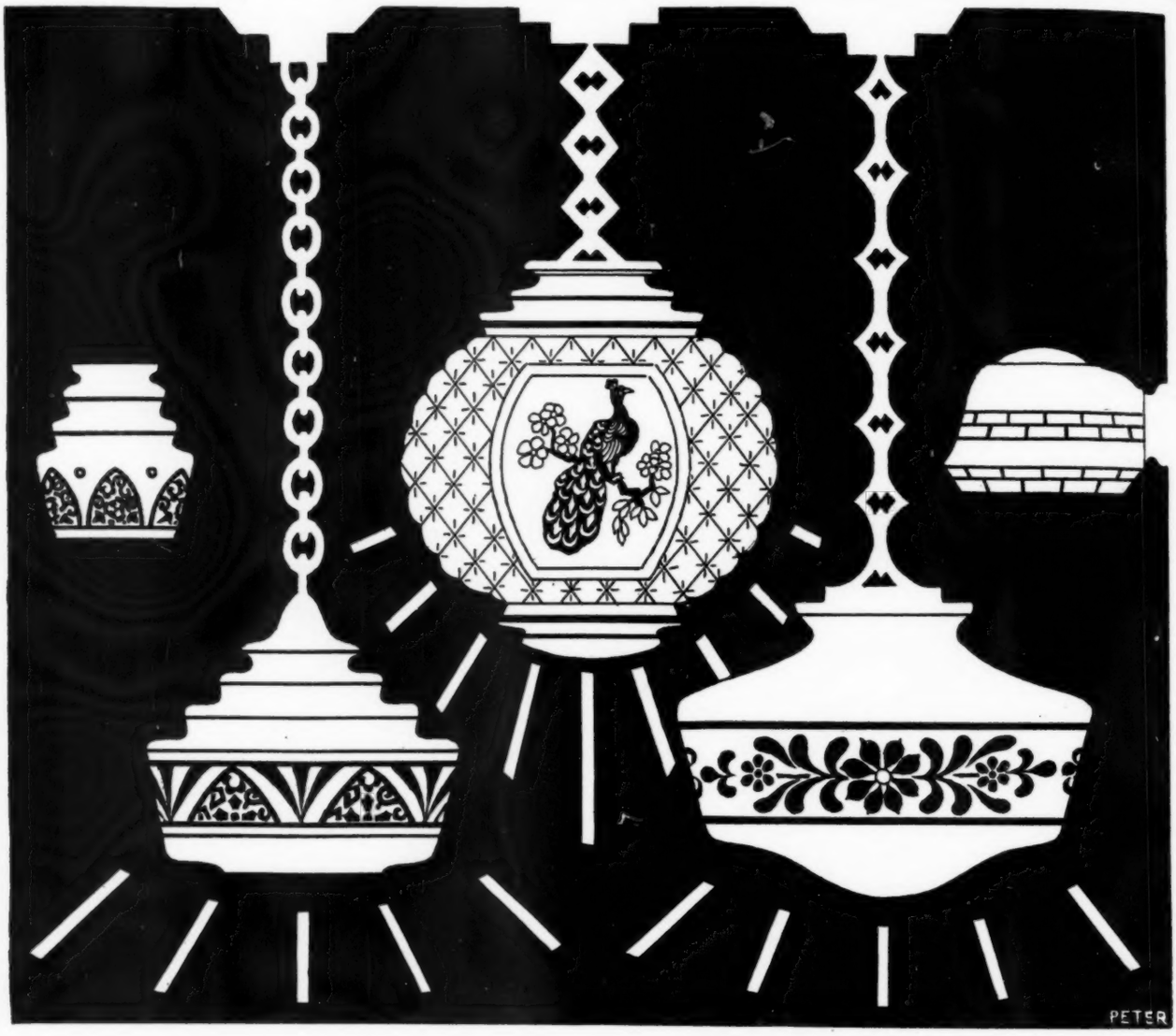
Wagner engineers invite you to submit your motor problems. They can advise without prejudice.

Literature on request. 76-7631-I

WAGNER ELECTRIC CORPORATION
6400 Plymouth Avenue, St. Louis, U. S. A.
WAGNER SALES OFFICES & STATIONS IN 25 PRINCIPAL CITIES

Products: FANS . . . . Desk, Wall and Ceiling
TRANSFORMERS . . . Power, Distribution and Instrument
MOTORS . . . Single-phase, Polyphase and Direct Current

Wagner ...quality



New Inland Designs That Stimulate Buying

Our designers have produced these beautiful new styles, which meet the very pressing demand for modern glassware.

The above illustrates a few types. Literature, with full information, and prices on the entire line, is now ready. We will be pleased to mail this to you upon request.

INLAND GLASS WORKS, INC.
6101 W. 65th Street, Chicago, Illinois

Inland

THE LARGEST IN THE MIDDLE WEST

Why you can't figure profits with a sharpened pencil

Sharpened pencils have a way of puncturing prospective profits.

Why?

Why doesn't a cut in contractor's estimated prices build up a large, paying volume, as it does in other industries?

This puzzling question may have furrowed the brow of many thinking contractors. Yet the answer is fairly simple.

HERE is some very simple arithmetic: Figure your average profit at twenty per cent per job.

Now forget the profit for a moment—but only for a moment—and see what happens when you "shade" your estimates a mere ten per cent.

Have you "shaded" your profit ten per cent? You have not. You have "shaded" it fifty per cent.

Or put it this way: You must get two jobs for every one you had before; *and even then you make only the same total profit as before.*

And meanwhile you run the risk that the other fellow will fight you with your own weapons; and you'll lose both jobs and profits.

Breaking through the Vicious Circle

Few industries have this terrific problem of building up volume without cutting down profits.

The average manufacturer may first create a volume business and then find his profits in the economies of big production.

But not so the electrical contractor.

His every job must carry its own profit.

So he seems doomed to run around in a vicious circle. He cannot increase his profit if he doesn't increase his volume. He cannot increase his volume if he doesn't cut his prices. He cannot cut his prices if he doesn't sacrifice his profit.

Apparently he can't increase his profit. He cannot, that is, unless he accepts and acts on the one saving thought in the situation.

In a field that is over-ridden with cut-price selling there is always room for quality selling. Quality then stands out by contrast. It becomes practically a non-competitive weapon for getting orders.

Even if it isn't Utopia yet

Of course not all prospective customers recognize the importance of quality electrical work. Nor will they, until contractors themselves are sold on the idea and its possibilities. "Has it any possibilities?" Contractors are justified in asking that question.

But they will find that the American public has already answered it in terms of other industries.

People — the same people who buy inferior electrical work—buy good cuts of meat, expensive golf clubs, brass pipe and high-grade motor oil.

Better buying habits can be instilled into this very public by the electrical contractor. Many contractors already think so and this Company has been glad to help them translate their thought into action with the type of electrical material that takes the job out of the range of the sharpened pencil.

No. 3 of a series dealing with the every-day problems of the electragist.

GraybaR
Successor to *Western Electric* Supply Dept.

The Graybar tag—symbol of distribution

OFFICES IN 70 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BUILDING, LEXINGTON AVENUE AND 43RD STREET, NEW YORK

Such Service to You Merits Orders from You!

The most successful of contractors know that an estimate from (FA) establishes the right price on every panelboard job, a price that can be depended upon to deliver quality yet be in line to get the job. (FA) always gives the right price *first*, and does it promptly. (FA) know their costs and have a sufficient volume of production to use progressive manufacturing methods. (FA) Panelboards and Cabinets are standardized, maintaining the highest quality at minimum cost.

In short, from the first figure to the final connection (FA) gives you the kind of service and the quality of product that merits the reward of orders. (FA) must make you successful to be successful themselves.

New (FA) Lock

A catch lock designed to operate easily with minimum projection (only ¼") and made entirely by (FA), quality guaranteed. Suggestions from contractors and architects were asked and followed. The result is a construction detail that calls for enthusiasm.

Go over the (FA) Catalog thoughtfully. Send for one if you haven't it and talk panelboards to an (FA) man. We are here to serve

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

DISTRICT OFFICES

Atlanta, Ga.	Dallas, Texas	Memphis, Tenn.	Pittsburgh, Pa.	Montreal, Que.
Baltimore, Md.	Denver, Colo.	Minneapolis, Minn.	Richmond, Va.	Toronto, Ont.
Boston, Mass.	Detroit, Mich.	New Orleans, La.	San Francisco, Calif.	Vancouver, B. C.
Buffalo, N. Y.	Jacksonville, Fla.	New York City	Seattle, Wash.	Walkerville, Ont.
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The Electragist

(The National Electrical Contractor and *The Electrical Contractor-Dealer)*

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Association of Electragists—International

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An Announcement to

Members and Subscribers

THIS issue of THE ELECTRAGIST completes the twenty-seventh year of the publication of its official journal by the Association of Electragists, International—originally The National Electrical Contractors' Association of the United States—since the first issue of *The National Electrical Contractor* in November, 1901.

In announcing editorially its first issue, *The National Electrical Contractor* stated that it would be "distributed to all the Electrical Contractors in the United States, having an issue of two thousand (2,000) copies a month." Today, as THE ELECTRAGIST completes the twenty-seventh year of that first magazine for the electrical contractors, this issue has a circulation of nearly nine thousand (9,000) copies a month.

THE great expansion of the electrical contracting branch of the industry has brought new conditions and new problems. In 1901 this magazine was the only publication to serve the electrical contractor. Today even the nine thousand copies a month of THE ELECTRAGIST cannot cover the whole field of electrical contractors who are serving the public and the industry. There is need of an electrical contracting magazine, serving the contractors' interests as does THE ELECTRAGIST, that can reach a much greater number of the contractors each month.

Such a magazine, requiring a greater editorial staff and publishing organization, is not in keeping with the functions of a trade association, and tends to overshadow its real purpose.

The Executive Committee of the Association of Electragists, International, after careful study, have decided to merge THE ELECTRAGIST into a new and greater magazine to be published by the Electrical Trade Publishing Company of Chicago, to be called "ELECTRICAL CONTRACTING with which is incorporated THE ELECTRAGIST," beginning with the November issue.

THIS new magazine, ELECTRICAL CONTRACTING, with greater circulation and greater capacity to serve the electragists, will be dedicated solely to the interests of electrical contractors and contractor-dealers. S. B. Williams, editor of THE ELECTRAGIST for the past four years, will be editor of the new magazine, and an advisory editorial committee of the Association of Electragists, International, through a ten-years' contract, will make ELECTRICAL CONTRACTING truly the organ of the Association.

Members of the Association will receive this new magazine as a part of their Association service as in the past, and our present subscribers who are not members will receive this greater magazine, "ELECTRICAL CONTRACTING with which is incorporated THE ELECTRAGIST," for the remainder of their subscriptions.

Association of Electragists
INTERNATIONAL

When the purchaser refuses to pay for lighting fixtures which the contractor has installed, the contractor has several ways to protect himself, one of which is the legal act of replevin. An understanding of this method of securing protection is very useful.

The Legal Right to Replevin

By LEO T. PARKER
Attorney at Law, Cincinnati, Ohio

THE law is well established that any person may legally replevin his rightful property, which is within the control or in the possession of another individual, particularly where the latter refuses to relinquish possession of it. However, there are several things to consider in determining whether a contractor may replevin lighting fixtures for which the purchaser refuses to pay.

First, it is important to know that a signed agreement by which an order of property engages a contractor to perform work, in accordance with definite plans and specifications, is a written contract which is controlled by the laws that relate to written instruments.

Where a contract for the installation of lighting fixtures is in litigation the Court will not permit either party to introduce testimony for the purpose of varying the meaning of the written agreement, unless it is shown to the satisfaction of the Court that one of the parties fraudulently induced the other party to sign it. For instance, in a quite recently decided case it was disclosed that an owner verbally promised to pay a contractor more than the sum specified in the contract. Upon completion of the work the owner refused to pay the verbally promised sum. The contractor instituted legal proceedings to recover the additional amount and requested permission of the Court to introduce testimony of an employee who heard the owner promise to pay more than the contract price.

Written Contracts

The Court held, however, the contractor not entitled to receive more compensation than the amount specified in the original written contract and explained that under all ordinary circumstances a written agreement is conclusive evidence of the business relations of the parties, irrespective of the verbal understanding or other later oral promises.

It is important to know, too, that where either a verbal or a written contract exists between an owner and a contractor, and either party fails to carry out a material part of the agreement, the other person who acts in good faith is relieved of all obligation and liability to perform his part of the contract. For example, where it was shown that a contractor agreed to supply labor and the materials of a specified quality to complete the job, the Court held that he was not entitled to *any* remuneration for the work done because it was proved that he wilfully failed to perform his part of the contract. Under these circumstances, of course, the contractor would not be entitled to replevin the fixtures for non-payment by the owner.

Remedies for the Contractor

In another case the Court explained the legal rights of a contractor where the owner fails to fulfill his part of the agreement. This Court said:

"It is well settled that where one party repudiates a contract and refuses longer to be bound by it, the injured party has an election to pursue one of the three following remedies: (1) He may treat the contract as broken and recover an amount of money equal to the value of the work already done; (2) or he may keep the contract alive for the benefit of both parties, keeping himself at all times ready and able to perform it, and he is justified in suing for its performance; (3) or he may treat the repudiation of the contract as putting an end to it . . . . for all purposes, *and sue for the profits he would have realized if he had not been prevented from performing his part of it.*"

Therefore, where an owner breaks a contract the contractor may, if he desires, finish the work and sue immediately for the profits he would have earned had the owner acted in good faith and carried out his part of the agreement, or he may refuse to do more work and sue immediately for *all* the profits he would have earned had the contract been completed in good faith by both parties. If payment is not forthcoming he may replevin the fixtures and other material not affixed to the real property in such a manner as to be a part thereof.

In a recent case, it was disclosed that a dealer sold lighting fixtures on 90 days' credit, with other important stipulations in the contract of sale. The purchaser failed to carry out certain parts of the agreement. The seller sued the purchaser and the Court held that the purchaser must pay the seller immediately the full amount of the bill, and before the 90-day period had expired.

It is quite apparent, therefore, that any material deviation from the terms of a contract will deprive the unfaithful party of all benefits therefrom, including the right to replevin the fixtures.

The Rightful Owner

Whether or not a contractor may legally replevin fixtures depends primarily upon which of the two parties is the rightful owner. In other words, a contractor never can replevin fixtures where the legal title is in the party who is in possession of the property.

But where fixtures are installed on the condition that the title to them remains with the contractor until paid for, and the owner refuses to pay the account, the contractor may either sue for the amount due, or he may replevin the fixtures. For illustration, in a recent case, where this point of the law was involved, the Court said:

"Where property is sold on credit *and the title thereto is retained by the seller,* the latter may, upon breach of the conditions of the sale by the buyer, treat the sale as absolute and sue for the value of the property, or he may treat the sale as of no effect and replevin the property."

Where a contractor enters into a legalized contract with an owner to

supply lighting fixtures and to furnish the labor for the installation with the understanding that the owner is to pay a stipulated sum of money either before or after completion of the work, the title to the fixtures does not remain with the contractor, because the relation of debtor and creditor exists, and therefore the contractor cannot replevin the merchandise.

On the other hand, if the fixtures are sold on consignment with the understanding that the owner is to acquire title to them when paid for, and with a separate agreement for the payment of the labor cost of installation, the title remains with the seller or contractor, who has the legal right to replevin the property.

The Burden of Proof

In litigations of this nature the burden always is upon the contractor to prove that he retains legal title to the property. Therefore, the importance of being informed of the law previously explained, which relates to contracts, is obvious. If the contents of a written contract indicate that the relation of debtor and creditor exists between the owner of the building and the contractor, the latter is not permitted to introduce testimony tending to show that the owner verbally agreed that the legal title to the fixtures was to remain with the contractor.

The mere fact that the owner refused to pay for fixtures led a higher Court, in a recent litigation, to say:

"In order to maintain an action for reclaimance (replevin), it is necessary for the party to prove the following facts: (1) that he is the owner of and has special interests in the property in controversy, (2) that he is entitled to immediate possession thereof, (3) that the other party wrongfully detains and holds possession of the same, and it is immaterial that the other party paid nothing for the property."

Contractors who desire to retain the right to replevin lighting fixtures should include in all contracts, the following clause:

"It is hereby agreed that John Doe, contractor, shall retain title to the (identify fixtures in this space) until the selling price, herein mentioned, of said fixtures shall be paid by (name other party to contract in this space) to said John Doe. Further, it is understood that said John Doe's rights to liens for the value of the labor supplied, in installing said fixtures, shall not be affected by the herein provision. And, that said John Doe retains the right to repossess said fixtures, when desirable to said John Doe, before the payment therefor."

Another well established point of the law is that fixtures applied to or installed in real property in such a manner that a removal therefrom permanently defaces the property, such fixtures become a part of the property, and a replevin suit is an improper action where the owner refuses payment, because the remedy of replevin relates only to personal property.

Another important point of the law relating to replevin is disclosed in a recent case (176 N. W. 786), where a contract called for the installation of equipment at a price of $1,575, one-third of which was to be paid immediately, one-third when the work was completed, and the balance 30 days after the completion of the work. The owner paid the first payment of $525, but no more. The contract provided that the contractor "shall retain the title to the materials and equipment until full cash payment shall have been made therefor, and which in the meantime . . . . shall be held without storage with the right of the company to enter upon the premises and remove the same in case of any default."

A written agreement takes precedence over later oral promises.

If the contract is broken you can collect for the profits you would have made.

A contractor can replevin if he keeps ownership of fixtures until paid for.

Burden of proof is on the contractor.

You can not remove fixtures if removal defaces the property.

You lose the right to replevin if the property is sold and the contract is not recorded.

After the contract was made but before the work was completed the owner leased the premises to a tenant. The legal question involved was whether or not the contractor was legally bound to demand payment of the owner or leassee. The Court held that the contractor was legally entitled to replevin the fixtures, but that he was bound to make demand of the leassee, and not the owner, because the ownership of the property was temporarily transferred to the possession of the leassee.

The law is well established that a contractor may not replevin fixtures where the real property to which they are affixed is subsequently purchased by a person unfamiliar with the terms of the contract between the contractor and the original owner or seller of the building (201 Fed. 548).

It has been held that a purchaser of real property is not bound by the terms of a chattel mortgage given by the seller of the building to a contractor for fixtures, where the purchaser is guilty of no deceit or misconduct and the mortgage is not properly recorded.

In another case (109 Atl. 750) the Court in explaining the law on this subject, said:

"Chattels attached to the real property in such a manner as to indicate that they are fixtures will pass by deed or mortgage of the real estate to a purchaser or mortgagee without notice, notwithstanding an agreement, either expressed or implied between the owner of the chattel and owner of the realty that they are to remain personally, and shall not become a part of the real estate."

When Property is Sold

In other words, if a contractor enters into a contract with an owner whereby the former is to install fixtures and reserves the right to replevin the fixtures, if unpaid for, the contractor loses his right to do so, if the owner sells or mortgages the real property to a person who is unfamiliar with the agreement between the owner and the contractor, and the contract is not recorded so that the purchaser has an opportunity of knowing of its contents.

In a recent case (114 Tenn. 255) the Court in explaining the reasons for this law said that where one of two innocent persons must suffer, the one whose acts caused the loss must suffer the loss, because one who places the power in a third party to deceive or impose upon another should be and rightfully is the loser.

On the other hand, where the purchaser of real estate should have discovered, by the application of ordinary care, that fixtures of the real property are subject to replevin by a contractor, the latter may always rightfully replevin them. (244 Fed. 730).

It is certain that where a mortgage or mechanic's lien dates prior to the contract between an owner and a contractor, the latter may replevin the fixtures if he has previously obtained a written consent from the holder of the lien or mortgage. (143 N. Y. S. 802).

Maryland Electragists Have Engineering Department

FOR the purpose of cutting down losses due to hasty or ill prepared estimates and improving wiring layouts as to engineering and adequacy, the Maryland Division of Electragists has started an engineering department under the direction of Frank G. Goudy, an engineer well known in Baltimore.

The broad duties of the department are as follows: 1. To keep in constant touch with engineers and architects in order to assist them in providing and preparing adequate electrical installations.

2. To interview builders and general contractors in order that they will better understand our problems and help to reduce the huckstering of jobs, whether the fault be with the general contractor or the electrical fraternity itself.

3. To show the electrical contractor that the way to help the industry is through the increased use of electrical material consistent with good practice, rather than elimination of necessary material in order to reach a price.

4. To make engineering surveys or estimates for members in order to make bids more accurate and to save the industry from the enormous waste that is entailed when each contractor makes up his own estimate.

The first three named articles are easily understood and no rules need be made to govern them. However, the Chief of the Engineering Bureau should, each month, make up a report of his activity in each group showing what he has done and what he has accomplished. The making of estimates *must necessarily be governed by rules* so that the greatest good can be accomplished and all the membership benefited. There is a direct expense involved in making a survey and this expense, or a portion of it, must be borne by those requesting and receiving the estimating service, in accordance with the following paragraph taken from the pledge of membership:

"We (I) further understand that the services of the above mentioned Engineering Department will be available to us (me) for a uniform charge on each job of one-half (½) cent an hour for the total number of hours of productive labor included in the labor survey of the job being estimated for us (me) by the Engineering Department."

Due to the saving involved in planning, all estimates requested on jobs where the layouts have been made by reputable consulting engineers *must* be figured by the Engineering Department.

Any other plans having a complete electrical layout, and which in the opinion of the Engineering Department have a prime cost in excess of $2,000, *must* be figured by the Engineering Department.

Incomplete Layouts

Jobs having an incomplete electrical layout, or none at all, must be referred to the architects and engineers committee through the head of the Engineering Department. Any two members of this committee can make a decision regarding the disposal of such a job.

Further rules and regulations will be submitted from time to time by the architects and engineers committee.

Members are urged to discuss prospective jobs with the engineering department and in a good many instances have been prevented from submitting estimates on jobs that were not provided with adequate plans and specifications. In one instance a member was about to submit a figure on a job with no layout at all, and upon analysis this job proved to be entirely too large for him, one that he could not economically handle and after a discussion decided to remain off the work.

While all jobs emanating from the office of a reputable consulting engineer must be figured by this department, it does not necessarily mean that a member must use the figures presented him, but it does serve him as a check in the event he makes up his own estimate. Just a few days ago a job went through in which the Engineering Department computed the quantity of half inch conduit at 2,400 feet, whereas the member had assumed the quantity of only 1,400 feet, a difference of 1,000 feet. On a job of this size it did make a material difference both in the material quantities and the labor quantities and this member saved considerable money by having these items brought to his attention. Then just a day or two ago another member had left out 27 outlets on a small job all of which involved taking out 27 old locations and replacing them with an equal number of new outlets. At present, each member asking an estimate or quantity survey is charged ½ cent an hour for each man hour that it is estimated the job will take to be completed. On some jobs, of course, only one member is figuring, whereas, on another there may be six or seven, but a preliminary survey indicates that this amount of money will be sufficient to run the Engineering Department without any loss. In view of the fact that there are a number of competent engineers in Baltimore, it is endeavored on every occasion to see that electrical layouts are made by one of them. The Engineering Department co-operates closely with these engineers and on a number of occasions have been instrumental in getting them to put in much more adequate wiring that was originally contemplated.

Considerable thought had to be given to the establishing of a rate for estimating. Should the successful bidder pay all or should all pay something?

Cost

In many instances the total cost of the estimate is less than ten dollars to a member, therefore a $10 service charge would not operate satisfactorily. It is very seldom that more than six figure on the same job and if this does return more than the estimate actually costs it only serves to counterbalance the many jobs where only one, two or three call for a survey.

Practically all members are continuing their estimating departments—and they feel that the figures furnished by the Engineering Department are an excellent check on their own figures. They regard it as the insurance on their estimate. Even if they don't get the job it does provide them with something to check against, whereas if they hadn't received our survey they might have gone in at a ridiculous figure because they had made an error in quantities of labor or material.

British House Wiring Methods

By D. S. MUNROE

In view of the discussion which has occurred during the past two or three years in this country, relative to the suitability of the several wiring types for house work, and the suggestion by certain interests that new and lower cost methods patterned on European types might be desirable, we are glad to be able to present an abstract of a very complete paper on British House Wiring methods presented this year by D. S. Monroe before the British Institution of Electrical Engineers. This paper has received wide-spread attention in Great Britain and has been favorably commented on by all of the English electrical journals. While the paper gives a complete resume of wiring methods and accessories and layout for small house work, we shall present only that part relating to the wiring systems now in use in Great Britain. — The Editor

THERE are many supply engineers and others impatient of delays and rules who think that the lowest first cost of wiring work is the main consideration. This attitude is not sound or safe and cannot, of course, be shared by the contractor who risks his capital and his reputation on the efficiency of every job he undertakes.

Wiring methods have been influenced not only by climate, varying temperatures and salt sea atmosphere, but by our variety of supply conditions and the early adoption of voltage considered unsafe for domestic use even by such commercial nations as the United States and Germany. The gradual evolution from lower d. c. pressures to 250 volts d. c., and our successive relaxing of rules governing the loading of cables, have permitted us to meet with comparative ease the limited increase of the power load in the older houses. Perhaps this very adaptability of our early installations has given some engineers too much confidence. It appears to the author that we have now reached a critical point in the history of wiring, a point at which all work should conform to certain clearly defined limits and principles. We contemplate as a nation the general adoption of standard supply pressures, and alternating current at 230 volts has been indicated as the probable standard for lighting and small-power purposes. It follows that in many quite small installations there will be an a. c. pressure of 400 volts between terminals and switches. Again, short-circuit values in houses must rise with the linking of large generating stations and the great increase in the cooking and heating load.

These foreshadowed changes in supply conditions should be prepared for now, and every contemplated installation—even the self-contained farm or country house 25-volt installation—should be arranged and wired to suit the ultimate standard pressure. It is time to tighten rather than to relax rules, to insist on improved internal insulating qualities in switches, lampholders and the like, and to look to our fusing and earthing methods.

In this paper the author purposes to sketch briefly the wiring systems and some of their accessories which are in daily use, and to indicate in connection with each the features which demand attention if the resultant installation is to be satisfactory.

By limiting the scope to the smaller class of house we necessarily cut out many of the more interesting problems and applications of wiring. The author hopes, however. that material will emerge for profitable discussion, and the paper will fulfil its purpose if it assists in the co-ordination of effort towards the safe and sound electrification of British homes.

(*a*) *Wood Casing and China Cleats* —Wood casing, designed originally to insure complete separation of the two polarities throughout an installation, latterly degenerated into a wood-trough system for the tidy conveyance of bunched conductors. In its first phase, when the Phoenix Rules flourished, wood casing was for the most part of good quality and fitted by skilled carpenters, under the supervision of Victorian foreman electricians. Under these conditions it produced the most enduring installations.

Then the introduction of light American butternut casing made it a cheap and competitive system. The carpenters were replaced by labor unskilled on wood-work and the bunching of conductors became so common that the somewhat risky practice was condoned in comparatively early editions of the I. E. E. Wiring Regulations. As a system it became discredited by its poor appearance and by the dangers to which it became liable through being used unsuitably in concealed and sometimes damp places.

The proper and efficient fitting of wood casing is now too expensive in labor to justify its inclusion among modern wiring methods in general use.

Installation engineers who remember the difficulties of mitreing, of making bends, curves and crossings, even with exposed wood casing, will agree that the concealing of such an essentially surface system invites trouble at an early date and risk of fire.

Cleat systems in which china insulators are employed to fix vulcanized-rubber cables or flexibles, while providing the cheapest possible means of wiring, are obviously unfitted for domestic purposes beyond perhaps the requirements of wooden huts or other temporary dwellings.

Improved methods of manufacturing cable have gradually eliminated the necessity for supplementing the cable

makers' insulation by something extraneous, such as the fillet in wood casing or the distance piece of a china cleat. At an early stage we became accustomed to the close proximity of the opposed conductors in the case of twin flexible cord, but the binding or lapping of two or more vulcanized, stiff conductors under one fibrous cover and designed for general circuit work, never became popular. Now, however, other non-fibrous forms of such self-contained composite conductors are much used.

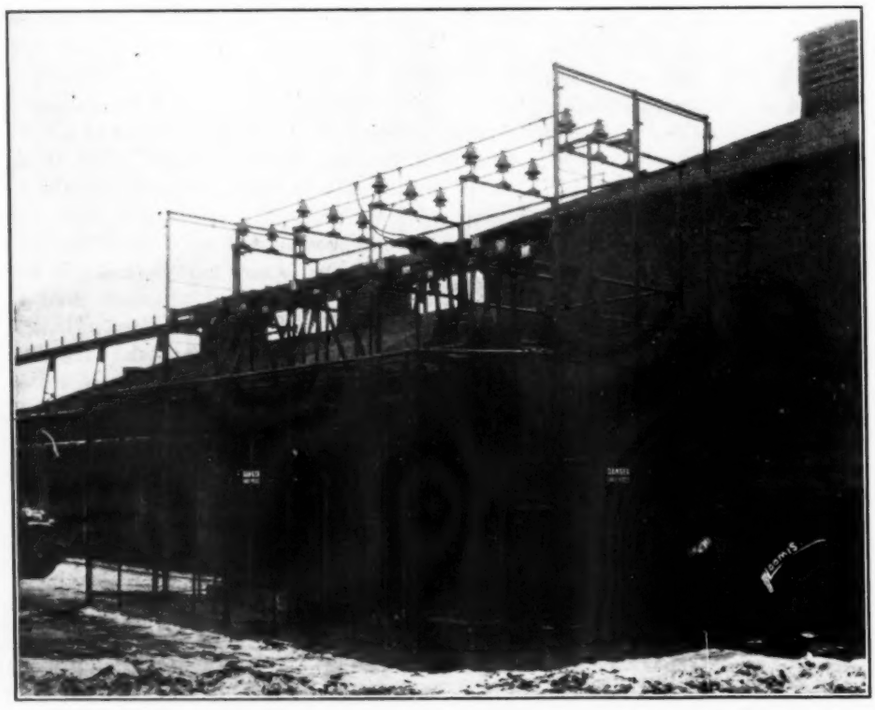
(*b*) *Cab-tyre Sheathing*—The well-known cab-tyre sheathing, which is a stout resilient covering of rubber compound, applied by annual extrusion over one or more vulcanized-rubber cores, was primarily devised for flexible cables in mines and workshops and was applied to that purpose with success about 16 years ago. As a protective covering for flexible cable it is ideal. It does not kink and it slips and bends out of threatened mechanical aggression as no other class of armor can. It has now for some years been much used as an outer protection for unbraided vulcanized-rubber cables for ordinary wiring work and as an alternative to a metal protector. Under normal wiring conditions, where the conductors require the quality of comparative rigidity for neat setting at moldings, etc., and where the cables have necessarily to be supported by clips, the liveliness of cab-tyre sheathing would appear to be at a discount.

This type of cable has other qualities most valuable for general wiring work. It is moisture-proof and is not apparently affected by plaster or cement. It is inconspicuous and light in weight; its smooth outer surface lends itself to the application of oil paint or distemper, and it is not readily ignited.

The extreme portability of the cable, and the simple tools necessary for its erection, reduce to a minimum the time required for the placing of the cable in position. Owing to the small bulk of cab-tyre sheathing and to the unlikelihood of it being damaged by a plasterer's trowel, it can be buried in the ordinary plaster coating of brick walls, or on occasion the cable can be laid in a plaster channel which is afterwards sealed by Keene's cement. These qualities have led to this type of cable being introduced into many thousands of houses in recent housing schemes.

While the sheathing is itself most waterproof, being continuously subject to visual inspection during manufacture before subjection to the usual immersion tests, some care is, of course, necessary, especially in regard to treatment of cable ends, when it is being fitted in damp places.

The cable is made in single and also in flat or round twin and in round three-core form. It has hitherto been more expensive than lead-protected cable, but within recent months a special quality has been available at a competitive price.



A Neat Substation Installation. G. H. and J. T. Kelly, Electrical Contractors of Elmira, N. Y., Have Recently Made a Number of Industrial Substation Installations. The Photographs on this and the Opposite Page Show the Outside Transformers and the Switchboard in the Plant of the Elmira Foundry Co., a Recent Installation of the Kelly Firm

Maconite

(*c*) *Maconite*—A more recently introduced system with insulation of the compound class has attained a high degree of recognition throughout the country. The Maconite insulation is comparatively dark in color and is more flexible than any other insulation employed for cables, with the exception of pure rubber. Of slightly gelatinous appearance when newly cut, the material is completely vulcanized and does not get plastic when made warm by overload or by outside cause.

Maconite insulation is not microporous and is thus not susceptible to penetrating oxidation, and it remains pliant at very low temperatures. It withstands acid and alkali fumes and can be used in plaster or underground without additional protection, the material being sufficiently resilient to resist a fair amount of abrasion. In an old underground piping where ordinary vulcanized-rubber fibrous-coated cables have failed, Maconite has proved a more lasting substitute as it is not apparently so much affected by rust. It is made with braided covering for such conduit work.

This form of compound insulation can be supplied with a lead-alloy covering directly applied, and as the complete cable is free from any fibrous layer or constituent the risks of surface leakage at the cable ends are obviated. Maconite is of most general interest, however, when considered as a surface system without lead or braided protection. For this surface use it is made in single and in twin figure-of-eight section and also in triple form. One of the coverings in the twin and triple pattern is ribbed longitudinally to enable the polarity to be distinguished. The cable can be clipped to walls by small metal saddles or lead-headed wall nails or by special short channelled wood pieces fixed by screws or pins through the centres.

Beading made of satin walnut and of

the same section as the wood pieces is supplied for application to this wire. The beading does not completely cover the wire, i. e., it does not overlap to the extent of reaching the wall surface. This feature is of value when the wall surface is rough or uneven. The inequalities are taken up by the yielding insulation and are not reflected on the outer surface of the beading.

Deeper channel covers which completely cover the wire, are also available, and these may be held by screws or by spring clips, which obviate the need for nails or screws penetrating the web between the conductors. Neat and effective universal non-metallic junction boxes, corner pieces and tee boxes have been specially designed for the system, and also steel channels for use where nail penetration might be anticipated.

Lead-Alloy Systems

While the lead-alloy cable dimensions are now standardized, the different makers have each their own designs of binding and bonding clips and boxes.

It is primarily to secure a measure of watertightness and good metallic continuity that such cable is adopted, and it is regrettable that so many of the junction and outlet boxes issued for lead-covered work do not ensure the first quality and only inadequately provide the second. With screwed conduit systems we have a protector which is itself robust, and boxes (to protect the weaker points, e. g., joinsts, etc.), which are relatively heavier and even more enduring. With lead-covered systems the reverse is the rule and the boxes are more fragile than the sheathing.

Lead-alloy systems are now much used for hire-purchase installations fitted in old houses; and in such conditions it is desirable, apart from the question of continuity, that the joint boxes be of such a form as will not too readily invite amateur inspection or extension.

There is little to be gained in neatness by using stamped accessories when cast boxes are availabe. Many contractors, indeed, use only iron conduit boxes with nipple and lead-wool bonds when fitting lead-alloy wiring, but cast and tinned brass, lead and aluminum alloy joint and outlet boxes are obtainable and are preferable in appearance.

Precautions to ensure continuity are important with lead covering, in view of electrolytic dangers to which as a system it is particularly exposed, quite apart from the main purpose of bonding, which is to provide for the sudden and safe conveyance to earth of emergency current-surges.

The soldering of bonds is suggested in the I. E. E. Wiring Regulations, but even this has its dangers and in the present-day struggle to keep down costs it is rarely resorted to as a means of attaining continuity.

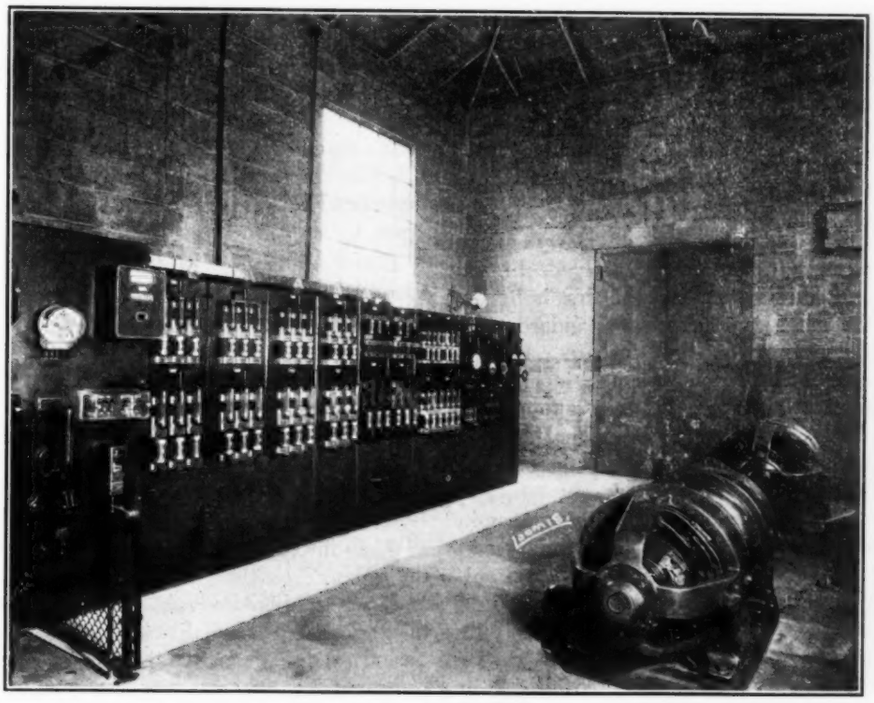
The Wiring Regulations specify a resistance test for lead-covered wires after erection, but few ever carry out this test or know how long the continuity conditions may be stable with the brass or aluminum clamps or pinching screws commonly used, especially after oxidation, dust and a film of paint have combined to fill the uninterrupted air channels which are too often features of modern continuity clamps. Pinching-screw contacts with a material so soft and inelastic as lead do not inspire confidence, and one feels that there is a need for the more strict specification for the dimensions and tinning of clamp bonds for this most useful class of cable before the system can be conscientiously recommended as reliable and safe.

Lead-covered cables share with the insulated systems the disability of being readily pierced by nails, a danger not to be depreciated, as faults due to this cause are quite common. The lead covered cable has the advantage, however, that it automatically indicates those particular faults caused by nails which actually touch the contained live wire. A nail, however, may penetrate the cover only, or the cover and the conductor which is at earth potential, and the fault may remain dormant.

Conduit Systems

(*a*) *Slip Conduits*—Zinc conduit played a useful part in the early development of wiring, and in various forms is still popular on the continent. It is practically incorrodible under all ordinary conditions and responds so readily to temperature-changes that condensation is unknown. During its vogue in this country it was seldom, if ever, employed as a surface system and was sometimes used for the concealed portions of wood-casing installations. Zinc tubing, however, was lost sight of—except for bell work—in the quick rise to favor—about 1900—of light-gauge enameled steel conduits.

The unscrewed light-gauge steel conduit was from the beginning cleverly advertised along with an attractive series of boxes, bends, elbows and the like, and achieved the popularity which attends good publicity. It could be erected with great rapidity and occupied less space than the wood casing or the heavy wrought-iron screwed barrel



Switchboard and two of the Motors in the Plant of the Elmira Foundry Company, Installed by G. H. and J. T. Kelly

tubing, which were then its chief competitors—and it was also much cheaper. This steel conduit, in practically its original form and range of dimensions, some sixteen years after its introduction, achieved the distinction of being designated Class A in the British Standard Specification for Electrical Conduits.

It was found by many to be too susceptible to rust for general adoption, and its enameled slip-in couplings prevented metallic continuity.

It is chiefly as a concession to economy of first cost that the Eighth Edition of the Wiring Regulations countenances slip-socket conduit. The sockets must be of the (so-called) continuity pattern and be provided with some form of screwed or grip joint. The regulations, however, also state that the conduit joints must give ample and permanent electrical conductivity, and specify an electrical resistance of not more than two ohms between a point near the main switch and any other point of the installation.

Light-gauge conduit will continue to be used for bell work, but for lighting it is now practically confined to what a reputable firm of conduit makers call the "country trade," and its passing will probably not be regretted even by the manufacturers, who report "an enormous increase" in the output of heavy-gauge screwed steel conduit.

Steel Conduit

(*b*) *Screwed Steel Conduit*—Steel conduit lined with insulating material other than enamel, is now rarely called for, and the sizes and gauges given for Class B in the British Standard Specification have been adopted by nearly every installation engineer.

The three classes of heavy gauge electrical conduit are welded, brazed and solid-drawn, and the first is by far the most popular. The standard sizes range from one-half inch external diameter, to two and one-half inch. From figures supplied to the author from the leading makers it is evident that the order of the demand for these is as follows:

When the conditions are severe, as in outside work, the conduits are preferably galvanized and coated with aluminum or red lead paint at the couplings. In addition to the more usual tube treatments, e. g., hot galvanizing or electro-galvanizing, there is now available a zinc-impregnated conduit of exceptionally smooth finish and ductility. The manufacturing process of this "Z. I. R." conduit consists of heating the cleaned steel conduit in a muffle furnace along with a special zinc compound for a prolonged period and at a definite high temperature until the zinc sublimes and permeates the pores of the exterior and the bore of the conduit. The matt grey surface of this special conduit is attractive and the conduit stands up to several salt-spray tests.

Enamel

For ordinary domestic work, however, the insulating black enamel as supplied by British conduit makers, is sufficient protection against rust, and it is of a good elastic quality which is rarely found to scale or chip.

Conduits are usually delivered in bundles with the screwed ends protected by canvas, straw or cardboard covers, and these should be left on until the tube is actually required. The standard specification gives conduit length of 10, 12 and 14 feet. In commercial practice, lengths of 15 feet or even longer are not uncommon.

When well planned and erected by tradesmen there is no doubt that a heavy-gauge steel conduit installation provided with metal outlet and junction boxes represents the best wiring practice.

For most building structures and for practically all modern dwelling houses we may estimate the life of the conduit as equal to the life of the building.

A good conduit installation implies the use of good vulcanized-rubber cables taped and braided, and this class of cable, especially when of C. M. A. manufacture, we have learned to rely upon.

These conducting cables also in a draw-in-conduit system are fitted under the most favorable auspices. They are not exposed to moisture or to the vicissitudes of the earlier building processes as is the case with cables buried in plaster, but are drawn in when the house is dry. Under such conditions one may count on a long life for the rubber insulation.

When in the course of 20 or 30 years the rubber is oxidized and perished—and all rubber or rubber-compound insulations are unreliable in about that period under the climatic conditions prevalent in this country—the cables can be rapidly withdrawn from the conduit and replaced without any disturbance to wall surfaces. The same cannot be said of any other wiring system, and this quality of easy and inexpensive rejuvenation without involving repainting and repapering, is the strongest possible recommendation to the adoption of the screwed-conduit system.

Overheating and moisture are the two most common causes of the breakdown of rubber insulation. The first does less harm to a cable free to expand within the air space of a good heat-conducting steel conduit than to insulation possibly gripped and strained by the varying expansions of its alleged protector.

Moisture reacts directly on the rubber and by the formation of rust releases further chemical agents inimical to insulation, so where conditions point to possibilities of condensation it is wise to provide a small drip outlet at the lowest point of the system.

The outlet boxes, characteristic of a good conduit system, protect the rubber ends from dust and provide effective mechanical means for the fixing and earthing of switches, sockets and fittings. The conduit boxes have more room than is usual in the classes of outlet employed with lead-covered or compound system, so that it is possible to provide a useful inch or so of additional coiled cable ends at switch, socket and fitting outlets.

Selection and Comparison of Systems

Having briefly described and commented on the chief materials associated with modern wiring, the author might, with advantage, set out his conclusions as to the comparative merits of the typical systems for the wiring of houses. It must be kept in view, however, that in the insulated, the lead-alloy and the screwed conduit systems, there are three types of wiring with distinct qualities which entitled all three to remain valuable agents for the conveyance of electrical energy. The final selection must depend on the conditions under which work is undertaken, and enduring installations can be attained by any one, or even by a combination of any two, provided the planning and workmanship are good.

The insulated system of wiring, here represented by the C. T. S. and Maconite system, follows the early ideal, which was to keep the two conductors remote from "earth." When there is no metallic continuity to be maintained,

COMPARATIVE LABOR COSTS EXPRESSED IN PERCENTAGES

	Finished But Unfurnished House	Furnished House, Occupied	New House; Access Before Floors Laid or Lathing Commenced
(a) Screwed steel conduit with outlet boxes at all fitting and switch points.....	100	150	80
(b) Lead-alloy wiring with wood blocks at outlets, clamp bonds	70	95	75
(c) C. T. S. unprotected and with wood blocks at outlets	50	60	55
(d) Maconite, with channel protection where exposed. Wood blocks at outlets	55	65	60

this system can be fitted more rapidly than any of the others. This is an outstanding merit at present, but it must not quite blind us to other aspects. The system is less fireproof than the others and, while it offers the greatest immunity from chemical attack, it appears to hold a middle place as regards resistance to mechanical injury. Although the sheathing is not selected for its high insulation properties, the system when fitted will provide with least effort the highest insulation test.

In the author's view it fails as an ideal system because the non-conducting sheathing links up a series of conducting accessories and appliances such as fittings, switches, joint boxes, fuse boards and the like. If all those necessary components were also covered by enduring insulation which was at the same time shock-proof and condensation-proof, then the underlying ideal of the insulating system might be attained.

"Earthing" or Grounding

We know, as engineers, that there are dangerous possibilities in every unearthed fitting fed by earth supply. With an insulated system we may run a separate, bare earth wire around the entire installation or have an earth conductor embodied in a composite three or four-core cable. The first method is too crude and the second presents many practical difficulties for housework. Both alternatives add to labor costs to an extent which almost cancels the chief recommendation of the system. Neither method affords complete protection against the chance nail which reaches the live conductor only.

The lead-alloy system, if carefully fitted, is a metallically continuous and earthed system, although the sheathing is not so good a conductor as screwed conduit. The lead-alloy cable cannot be passed behind lathing and beneath floors quite so freely as can C. T. S. or Maconite cables, on account of its more inert nature and the care necessary to avoid possibility of gas-pipe contacts. More consideration is required in handling the cable and in treating the ends at joints and the like. As usually fitted with wood blocks at switches and fittings the time required for installation is a little more than is necessary for the insulated class.

Should one doubt the permanence, however, of set-screw bonds, especially on a vibratory a. c. supply, and decide to use soldered contacts or metal-packed glands and metal outlet boxes, then the cost of the system ceases to be attractive.

Comparisons

When comparing systems, especially as regards costs, we must not fail to make sure that accessories included with one have an equivalent in the others. Thus, if we include boxes at outlets with, say, a conduit system, we must allow for boxes at outlets for lead-covered work. For ordinary housework, if the insulated systems are used, there is apparently not so strong a call to fit outlet boxes for surface work. Their absence detracts somewhat from the facility of providing spare cable at ends and may increase the fire and damp hazards. With C. T. S., Maconite and other systems of their class, they are not required for earthing—that is to say, if we overlook the necessity of earthing.

Screwed steel heavy-gauge conduit requires more labor to install in the average house than is the case with the more flexible systems, on account of the increased floor-lifting and wall-chasing and by reason of the necessary cutting, bending and screwing of lengths.

Considering the case of a ten to five-roomed house, we may take it that a fair comparison of the cost of labor, based on general experience, would be as shown in the table.

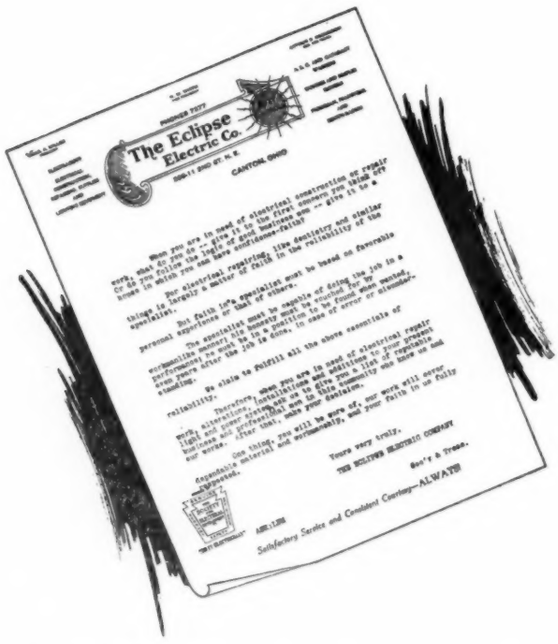
The insulated and the lead-covered systems require at least three times as many fixture points as are necessary with conduit, and in the skeleton framework of a house in course of erection they must take longer routes for protection and their selection often involves much boring of joists. In such conditions conduit may run diagonally above or below joists from point to point without any cutting and consequent weakening of the joists or beams.

When cast outlet boxes are used with lead-covered cable (B) and earth wires and boxes fitted with insulated cables (C) and (D), then at least 10 per cent must be added to the labor costs of erecting (B), (C) and (D). Such an addition has an effect of making lead-covered work more expensive than conduit for new houses and brings the cost of insulated systems very close to that of conduit, and the author does not doubt that more protection and greater economy in the long run are afforded by the screwed-conduit installation.

Outlet Boxes

The joint and outlet boxes for all three systems are very similar in price. The costs of non-association C. T. S., Maconite and lead-alloy cables of twin 3|.029 size are practically the same, while a similar length of 5-8 in. screwed conduit, with its couplings and a pair of 3|.029 vulcanized-rubber cables is approximately 20 per cent cheaper. When we compare in the same way the cost of a 3-4 in. conduit with its five contained conductors against the same number of conductors in the semi-flexible systems, we find that the cost with conduit is approximately 50 per cent less.

The author's conclusion is that there is no advantage in adopting a wiring system other than screwed steel conduit for domestic work, except in cases where the installation has to be fitted in an occupied and finished house. House requirements are so varied that we shall never attain complete standardization of accessories. But if we can increase the demand for the best system with its complement of well-designed junction and outlet boxes, we shall by quantity production lessen its cost, and if the Institution, in view of standardized supply methods, lends its weight of opinion in favor of a continuous and earthed draw-in system, the resultant concentration on this manner of installation would, in the author's opinion, be of advantage to the electrical industry and to the public.



Direct Mail Advertising Is Profitable

Consistent Promotion Program Produces Good Results for Contractor

THE consistent mailing of letters to prospects has secured wiring jobs from 5 percent of Canton, Ohio, people who obtain building permits, without the aid of canvassers or advance salesmen. And the letters cost less than five cents apiece—including postage.

A. S. Koenreich, secretary and treasurer of The Eclipse Electric Company, Canton, Ohio, which is making this good record, is a firm believer in the power of letters to produce business of all kinds—wiring jobs, rewiring, appliance sales and fixture sales. "We find that direct mail advertising is steadily taking the place of house to house canvassers or salesmen," he says.

Lists are obtained from a number of sources. Those who apply for building permits are immediately put on a preferred mailing list and letters are sent describing the construction work performed by The Eclipse Electric Company, and urging them to take advantage of the reliability of a specialist. From this list Mr. Koenreich says they make sales to at least 5 out of 100 and frequently more.

Letters are also mailed to a list of old customers obtained from the ledger. From the newspaper accounts of weddings a list of newly-married women is obtained and a special letter is directed to them. Salesmen are constantly building prospect lists of their own which are used for mailings and then the salesmen follow-up and find it much easier to make the sale.

The letter shown above is sent to prospects for construction jobs. The text of the letter for newly-married women follows:

"First impressions are strongest and the newly-married woman surely wishes her home to make a good impression on visitors who will call on her. Let decorative lighting help YOU to create a hospitable and beautiful home because it is one of the most valuable aids a woman can enlist today.

"A great deal depends on the types and kinds of lighting equipment you install in your home from the outside porch to the third floor and the method by which you shade these lighting sources. In this matter we offer you our assistance. After all decorative lighting is more or less a matter of science and cannot be decided offhand.

"In the hallways, in the living and dining rooms and throughout the rest of the house the right kind of lighting fixtures will make the room. In our widely assorted stock on display in our lighting salon are just the types of overhead fixtures, brackets, shading glassware which will make those colorful effects you have undoubtedly seen.

"The service we render in assisting our customers to secure artistic lighting is freely offered because we are purveyors of lighting rather than mere sellers of fixtures and shades. For this reason, before furnishing your new home, it will be helpful if you will consult us because we shall then be in a position to make useful suggestions and if required plan the entire installation for you room by room.

"Remember, a well-lighted home is well planned in advance. It never 'just happens.' It will be a pleasure to serve you.

"Yours very truly,

"The Eclipse Electric Co."

We accept without question the registration and licensing of barbers, doctors, druggists, lawyers, professional engineers, who are examined on their proficiency in the technique of their professions. Portland, Oregon, has carried that idea a step further and now examines and licenses supervising electricians on the technique of wiring and problems of the Code. F. D. Weber, author of this article, believes that poor technique on the part of journeymen is the cause of nearly all non-approved jobs, and that this can be cured by the Portland system.

Examination of Supervising Electricians

By F. D. WEBER

Chief Electrical Engineer, Oregon Insurance Rating Bureau; Secretary of the Examining Board City of Portland, Oregon

IF electricians or contractors never made mistakes or forgot (intentionally or otherwise) to comply with City or State Electrical Codes under which they are working, there would be no need for inspectors. Many times contractors are business men and not electricians, consequently, their mistakes are through ignorance more than neglect. The larger the contracting firm generally the greater the number of corrections they receive from the inspections departments and consequently the greater effort and time consumed by the electrical inspection department getting correction, as most contractors pursue a policy of having each individual journeyman make his own corrections. The matter becomes more complicated when the labor turnover is large; then, many times, corrections are received after the man responsible for the error has left the employment of the contractor. Feeling that this condition could be improved for both the contractor and the city electrical bureau, the City of Portland, Oregon, passed an ordinance requiring that supervising electricians must pass an examination and be licensed. It was furthermore felt that by so doing a premium would be placed upon knowledge and industry.

The ordinance went into effect in 1918 and has been in operation ever since but it was necessary to amend it from time to time. The present ordinance classes licenses as follows:

a. Any person (other than noted in subdivision (2) of this section) who engages in the installation, alteration, maintenance, or repair of electrical wiring, equipment, apparatus or fixtures in or about buildings in the City of Portland, is required to have an electrical construction license. Such person is required to have a separate license for each place of business conducted by him.

b. Any person who regularly maintains a competent electrical maintenance man doing maintenance work only (as defined by this ordinance) in or about his (the employer's) own buildings or property for such employer's own purposes and use only, is required to have an electrical maintenance license. Such licensee need not have the license provided for in sub-division (1) or subdivision (3) of this section.

c. Any person who directs, supervises or controls, the installation, alteration, repair or maintenance of electrical equipment, wires or apparatus, except as noted in sub-division (2) of this section, is required to have a supervising electrician's license.

The requirements for supervising electrician's license are as follows:

a. Applicants for license as supervising electrician shall file with the Electrical Division an application containing an affidavit setting forth that such applicant is not less than twenty-one (21) years of age, and has had not less than four (4) years' experience in the installation, alteration, repair and/or maintenance of electrical equipment, wires and apparatus and shall submit to an examination before the board of examiners touching upon his fitness and qualifications pertaining to the installation of electrical wiring and apparatus. Applicants shall be required to receive an average of not less than seventy per cent on such examination. A certificate of graduation from, or an affidavit of attendance at, a recognized technical school or college may, at the discretion of the board of examiners be credited as part of the required four years' experience. (The form of application a supervising electrician must fill out is shown in Fig. 1).

b. The supervising electrician shall receive from the electrical division a license empowering him to countersign applications for electrical permits and to perform or direct electrical work authorized by such permits for the current calendar year. The name of the person, firm or corporation for whom permit applications are to be countersigned shall be set forth in the license and it shall be unlawful for any supervising electrician to countersign permit applications for more than one person, firm or corporation. Supervising electricians must sign all requests for final inspection.

c. The supervising electrician may be relieved from further responsibility under any permit countersigned by him, if notice in writing to that effect be at once filed with the electrical division.

d. Each supervising electrician shall renew his license on or before the second day of January each year. If more than one calendar year shall elapse between application for renewal of license and the expiration of his last license, he shall submit to a re-examination. No fee shall be charged for such re-examination and it may be either written or oral, at the discretion of the Board of Examiners.

In the Portland ordinance there are provisions for a board of examiners who prepare questions and examine candidates for licenses as supervising electricians, and for a board of appeal to which disgruntled candidates can appeal.

The license fees are as follows:

a. License fees shall be paid as follows:

Classification of Licenses	Fee for 1st Year	Fee for Renewal
Electrical Construction	$50.00	$10.00
Maintenance	5.00	5.00
Electrical Dealer	5.00	5.00
Supervising Electrician	1.00	1.00

b. All licenses shall be for the calendar year or fraction thereof, and shall be obtained on or before January 2nd of each year, and shall expire at midnight on December 31st. Where a license is obtained after July 1st, the respective license fees shall be half the amount noted in paragraph (a) of this section; provided, however, that as to supervising electrician and electrical construction licenses no such deduction shall be made.

c. Where a license is permitted to lapse by failure on the part of the licensee to renew same on or before the date of expiration, the renewal shall date back to the date of expiration of the expired license, and no license shall be renewed after a period of one year from date of expiration.

In order to enforce an ordinance of this character it was necessary to have a board of examiners, which is covered as follows:

Personnel of Board.

a. The board of examiners shall consist of three members appointed by the Mayor who, by experience and training, shall be qualified to pass upon the fitness of applicants for registration as supervising electricians. Members shall hold office for three years unless removed for cause. One member of this board shall be a competent electrical mechanic, one member shall be a bona fide electrical contractor, and one member at large. Each member of this board shall be thoroughly familiar with electrical matters, both theoretical and practical, and competent to pass judgment upon the same. In case of the necessary absence of any member of the board of examiners, the Mayor shall make temporary appointment of a substitute. All vacancies occurring on the board of examiners for whatever cause shall be filled by the Mayor.

b. Any member or members of the board of examiners may be removed by the Mayor for malfeasance in office, incapacity or neglect of duty.

Duties of the Board of Examiners.

a. The duties of the board of examiners shall be to hold examinations at a stated time quarterly for the benefit of all applicants who desire to be

licensed as supervising electricians; to correct such examination papers and to return a certified list of all applicants, together with their respective examination papers and to return a certified list of all applicants, together with their respective examination ratings, to the electrical division within thirty days from the date upon which the examination is held.

Application for Examination. (See Fig. 1)

a. Each person desiring to take the examination shall make application upon a standard application blank at least five days prior to the regular quarterly meeting of the board of examiners.

b. Each person taking an examination shall pay to the city treasurer a fee of ten dollars at the time of filing his application. This fee shall entitle him to a license as supervising electrician until the first day of January of the year following the date of examination, providing that he also secures the required rating upon his examination papers.

Compensation of Board Members.

a. Each member of the board of examiners shall receive from the city treasurer twenty dollars for each regular examination held. This shall cover examination and grading of papers. The members of the board shall receive no pay for any meeting at which no examination is held, and no member of the board shall receive pay for any examination he fails to attend.

Board of Appeal

In order that the board of examiners does not have autocratic power, the City of Portland provides for a board of appeals to which any disgruntled candidate can appeal. The board of appeal is provided for as follows:

Personnel of Board.

a. The board of appeal shall consist of three members appointed by the Mayor, who, by experience and training, shall be qualified to pass upon the safety of installations and apparatus regulated by this Code. Members of this board shall hold office for three years, unless removed for cause. No member of the board of appeal shall sit in a case in which he is directly or indirectly interested, and, in case of disqualification for such cause, or in case of his necessary absence, the Mayor shall make temporary appointment of a substitute. All vacancies occurring on the Board of appeal for whatever cause shall be filled by the Mayor.

b. Any member or members of the board of appeal may be removed by the Mayor for malfeasance in office, incapacity or neglect of duty.

Duties of Board of Appeal.

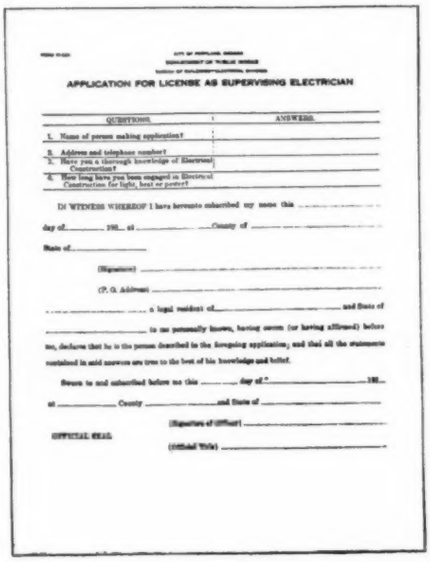
a. The board of appeal shall meet once a month on stated days, or oftener at the call of the chairman or notice from the inspector of any special appeal.

b. Any applicant for an electrical permit, whose application has been rejected by the inspector, or a person who has been ordered by the inspector to incur an expense in the alteration, repair or construction of the electrical installation of any building, may, within fifteen days thereafter, appeal therefrom by giving to the inspector notice in writing of such of an appeal; such notice or a certified copy thereof shall at once be transmitted by the inspector to the board of appeal. After notice to such parties as the board may direct, a hearing shall be had, and the board may by a majority vote affirm, annul or modify said action of the inspector. If the action of the inspector is affirmed, such action shall have full force and effect. If the action of the inspector is modified or annulled, a permit shall issue accordingly.

c. Any requirements deemed by the inspector necessary for safeguarding the hazard from fire and to life in connection with any electrical installation not specifically covered by this ordinance, shall be determined by the inspector, subject to the board of appeal in the manner prescribed by paragraph (b) of this section.

d. Materials and methods equivalent to those required by the provisions of this ordinance relating to electrical installations in or on buildings may, with the written approval of the board of appeal, be permitted by the inspector. A record of the required and equivalent material for method allowed shall be kept in the office of the chief inspector.

e. It shall be the duty of the board of appeal to submit to the council on or before the first of January of each year, a report giving a summary of all the decisions of the board, a list of equivalents consented to and a record of such other business as may have come before them, together with such recommendations as to desirable legislation pertaining to electrical installations in or about buildings, as may to them seem advisable.



APPLICATION FOR LICENSE AS SUPERVISING ELECTRICIAN

QUESTIONS.	ANSWERS.
1. Name of person making application?	
2. Address and telephone number?	
3. Have you a thorough knowledge of Electrical Construction?	
4. How long have you been engaged in Electrical Construction for light, heat or power?	

IN WITNESS WHEREOF I have hereunto subscribed my name this .....

day of....., 192... at ..... County of .....

State of.....

(Signature) .....

(P. O. Address) .....

..... a legal resident of..... and State of

..... to me personally known, having sworn (or having affirmed) before me, declare that he is the person described in the foregoing application, and that all the statements contained in said answers are true to the best of his knowledge and belief.

Sworn to and subscribed before me this ..... day of..... 192...

at ..... County ..... and State of .....

OFFICIAL SEAL (Signature of officer) .....

(Official Title) .....

License Application

Certified Check to Accompany Appeal.

a. Any person appealing from the decision of the inspector shall attach to the written appeal a certified check for five dollars made out in favor of the city treasurer, and in case the appeal is lost the check shall be turned over to the city treasurer as a fee, but if the appeal is granted the check shall be returned to the applicant.

As yet there has not been an appeal taken by candidates appearing before this board.

The first matter to confront the board of examiners was how to handle examinations of this character especially in the first years of its activities. It became apparent that it would be necessary in some instances to depart from the two general classifications of general supervisor and maintenance electricians and that if the men were doing only certain lines of work that it would be unreasonable to expect them to pass examinations general in their scope, consequently, in the years that this board has functioned examinations have been given in the following classifications: Maintenance electrician, general supervising electrician, supervisor for elevator installation, supervisor of fixture installation, supervisor for the thermostatic control for oil and gas burner equipment. In order to prepare examinations for these various branches it has taken quite a lot of ingenuity. We have followed the practice of allowing the maintenance men to pick eight questions out of the regular general supervisors' examination of ten questions for their test on code questions, but in the other classification of licenses it has been necessary to prepare special examinations.

The scope of the examinations is always a great problem and one which is the most difficult thing for the Board to decide. In the beginning all candidates were given practical work in a laboratory of a polytechnic school, where it was possible to give a few practical questions. This was weighted as 40 per cent of the examination; in addition to this there were two written sections given, one on simple problems relating to electrical matters and was weighted as 20 per cent. The second portion of the written section was on questions directly taken from the city electrical code and was given a weight of 40 per cent. After employing this method of examination for several years we felt that it was better to change the written examination of problems to an oral test giving this section the same weight. Finally, it was decided to again make a change, as we found that the practical work became so standardized that all applicants knew in advance what we could ask them, as a laboratory is limited in the amount of practical work that can be demonstrated in it and the following method of examination was adopted. As it is prerequisite for this examination for the candidate to have had four years' experience, the ratings were established as in Table 1.

Grades Required

Applicant must receive at least 70 points out of possible 100 to pass examination and be eligible to registration. At least 20 of these points must be obtained by the oral and written tests collectively.

In arriving at any final average rating a fraction of a per cent, if less than 5-10 shall be disregarded; if 5-10 or more than 5-10 shall be counted and deemed to be as an additional 1 per cent.

This method was tried out for a period of time and now it has been found that this had to be amended again and the present requirements are as in Table 2.

No candidate shall obtain less than 25 per cent on the written portion to obtain a passing grade, irrespective of his other grades.

Before the written examination is started each candidate is allowed to draw a number which is his identification number and placed at the top of all written papers. His name is then not known to the examiners until the papers are graded. This is done by placing slips of plain paper in enve-

lopes and then candidates draw one of the envelopes. He then writes his name on the slip of paper, returns it to the envelop and seals it up, but he must remember and use it as his identification number and place it at the top of each paper. The envelops are opened after the papers are corrected by the Examining Board.

Below are some typical questions used before practical examinations were discontinued:

1. Splices in Conductors:
   (a) In solid No. 4, B. & S. gauge rubber wire.
   (b) In stranded No. 4, B. & S. gauge rubber covered wire.
2. Bending Rigid Conduit:
   (a) Right angle bend in 1-2 inch conduit.
   (b) 4-inch offset in 1-2 inch conduit 12 inches from end of conduit.
   (c) Bend and fit conduit to a surface in the Electrical Laboratories.
3. Cutting Rigid Iron Conduit:
   (a) Cut 1-2 inch conduit off and properly prepare for locking to outlet box.
4. Soldering lugs to stranded No. 4 B. & S. gauge rubber covered wire.
5. Wire portion of circuit, knob and tube concealed ready for a single set of 3-way switches and on 2 ceiling outlets.

Set 2—

1. Make Splice in Stranded Wire:
   (a) Mechanical splice.
   (b) Soldering.
   (c) Taping.
   (d) Damage to insulation.
2. Pipe Bending:
   (a) Offset.
   (b) Right angle bend.
   (c) Threading.
   (d) Reaming.
3. Wiring in a set of 3 and 4 way switches.
4. Mount rheostat.
5. Reverse the direction of rotation of a shunt wound motor.

Set 3—

1. (a) Bend a "gooseneck" in conduit according to sample.
   (b) Bend an offset in conduit according to sample.
2. (a) Connect up heater switch.
   (b) Wire in a set of three and four way switches.
3. (a) Wire up a shunt wound motor to rheostat.
   (b) Reverse the rotation of the motor.
4. Hang a combination gas and electric fixture.
5. Solder lugs on stranded wire.

Problems

Below are typical examination questions given when problems were required:

Set 1—

1. Calculate the size of wires to be used for the following motors:
   1. 10 h. p. 220 volt, 85 per cent efficiency D. C.
   1. 5 h. p. 110 volt, 80 per cent efficiency, 3 phase 60 cycle induction motor.

TABLE 1

Four years experience required to take examination, therefore: 4 years	70%
One year additional experience	1%
Maximum experience grade allowed	90%
Experience, training and experience weight, college degree and no less, 2 years' experience	60%
Oral test	20%
Written test	20%
	100%

TABLE 2

That in the future four years experience is required to take examinations, therefore, 4 years	70%
1 year additional experience	1%
Maximum grade experience allowed	90%
Weight for experience, training and experience, college degree and no less, 2 years experience	50%
Weight, oral test	20%
Weight, written test	30%

The details of typical examination questions show what a Portland supervising electrician is required to know about wiring, motors, and the Code.

2. In a three wire system, with 30 1-2 amp. incandescent lamps between the neutral and the positive side, and 60 1-2 amp. incandescent lamps between the neutral and the negative side, how many amps. will be flowing in the neutral when all the lamps are burning?
3. How many 10 watt, 11 volt lamps in a sign using 909 amps.?
4. What size of rubber covered wire in conduit should be used to conform with the requirements of the city code with an allowable drop to the farthest lamp of 2 volts, the load consists of 42 incandescent lamps, which take 1 amp. each; distance 90 feet on a single phase, two wire system?
5. Given 10 circuits of 16-40 watt lamps; given 10 circuits of 20 amp. for electric heaters; two h. p. 230 volt D. C. motors; all to be connected to a three wire, direct current system, with individual circuits to be run from one center of distribution. Specify the following:
   (a) Minimum capacity of main service feeders in amps.
   (b) Minimum capacity of sub feeders in amps;
   (c) For each circuit of lights.
   (c) Minimum capacity in amps. for sub-feeders for heaters.
   (d) Minimum capacity in amps. for sub-feeders for each circuit of motors.
   (e) Draw a diagram showing the best and the most economical arrangement of main service feeders and each sub-feeder for the individual devices and motors specified, marking the proper size of rubber covered wire B. & S. gauge on the diagram.

Set 2—

1. (a) What size of rubber covered wire in conduit should be used to conform to the code when the allowable drop to the farthest lamp is not to exceed 1 volt, load equal 20 incandescent lamps of 1 amp. each, distance 50 feet; system being 2 wire direct current.
   (b) Same problem for two wire, 1 phase system.
2. (a) What size feeders must be installed for a three wire 110-220 volt, single phase system to conform to the code where the drop is 5 volts, distance 60 ft. load 60 amps., between one outside wire and neutral and 30 amps. between the other outside wire and the neutral.
   (b) Same problem for a three wire direct current Edison system.
3. (a) At 440 volts and 70 amps. on a D. C., 2 wire circuit, what would be the h. p.
   (b) Same problem on a three wire 3 phase system.

Set 3—

1. Give the h. p. in the following cases:
   (a) 75 amps., 440 volts, 2 wire direct current.
   (b) 75 amps., 440 volts, 3 phase, power factor 85 per cent, A. C.
   (c) 75 amps., 440 volts, single phase, 2 wire A. C.
2. Calculate the size of rubber covered wires to be used for the following motors to comply with the Electric Code.
   (a) 1-50 h. p. direct current motor, 550 volts, eff. 60 per cent.
   (b) 1-50 h. p. squirrel cage type constant speed induction motor, 440 volts, 3 phase, 60 cycles, eff. 60 per cent.
3. If your power bill is $20 per month and the rate is 3 cents per K. W. H., state in h. p. the energy consumed.
4. What size of rubber covered wire in conduit must be used to conform with requirements of the Electrical Code of the City of Portland, with an allowable drop to the farthest lamp of 4 volts, load consisting of 500 watts, distance 200 ft., on a single phase two wire alternating current circuit.

Below are typical examination questions now given for oral examinations:

1. Explain the hazards of a poor or partial ground on a conduit system.

2. If you desire to install a 125 amp. enclosed cartridge fuse, what size knife switch would you specify in order to have proper spacing of fuse clips?
3. How would you determine the size of any stranded wire? Explain in detail.
4. Define power factor.
   Define an ampere.
   Define a volt.
   Define a watt.
   Define a h. p.
5. What percentage of full load current must the leads of one three phase induction motor be designed to carry? Same for D. C. motor.
6. Explain fully what may happen if a No. 14 B. & S. gauge rubber covered wire is loaded so that it carries 50 amps. continuously when concealed in a wooden wall.
7. How can you tell a 3 phase A. C. motor from a D. C. motor? A single phase A. C. from a D. C.?
8. How many ways can a 3 phase motor be started and describe the apparatus necessary?
9. If electric power costs 3c per K. W. H. what will be the monthly bill be, if the load is on for eight hours per day and for 26 days in a month? Lamps 1000 watt capacity.
10. What is the h. p. consumed in an A. C. 2 wire circuit if the current is 10 amps., voltage 230, power factor .8?

Below is a typical set of examination questions now given for the written examination:

1. When transformers are installed inside buildings other than a central station or sub-station, by permission of the Inspection Department, how must they be installed?
   (a) Oil filled.
   (b) Air cooled.
2. How must a transformer or bank of transformers be protected?
   (a) Over 50 watt capacity.
   (b) 50 watts or less.
3. When a low potential feeder enters a building from transformers installed in a transformer vault within the building served, the switch and cutout may be omitted in the low potential feeder under what conditions?
4. (a) When are separate branch circuits required by the Code?
   (b) Tell how you determine the number of lighting circuits required by the Code?
5. What size is required in each of the following cases:
   (a) Service wire for a lighting system.
   (b) Smallest ground wire for a conduit system.
6. How must conductors be identified on grounded systems where the voltage to ground does not exceed 150 volts?
7. Describe in detail the complete installation from service switch to motor for a 10 h. p., 3 phase, 220 volt motor. State size of conduit, wires, type and size of switch and fuses.
8. (a) State where the following wiring methods are acceptable under the Portland Electrical Code:
   1. Conduit.
   2. Metal raceways.
   3. Metal wireways.
   4. Flexible metal conduit.
   5. Metal armored cable.

   (b) What wiring methods are required for additions, extensions and renewals to existing installations.
9. What outlet fittings must be furnished to comply with the Code?
10. How must an electric range circuit of 9 KW capacity be installed in combination with four circuits of lights in a new single dwelling and give a list of the necessary equipment and fittings.

Usually ten questions are given for the written test on the city electrical code.

It might be of interest to note at this point that oral examinations are given as follows: During the time the written examination is being held or after a candidate is finished he is taken into a separate room and given the oral examination. The examiners have a card file on which is written one question on each card, the candidates are allowed to select five cards at random and each must answer these questions orally. Sometimes the same five questions are given to all candidates the first candidate answering the oral questions is allowed to select the cards from the file. The oral examination gives the examining board a chance to have personal contact with each candidate and in that way to find out if he is actually capable to be a supervisor.

The examinations are generally held on Saturdays, as it is easier for the candidates to appear on that day and as the examination is now arranged to consume about three hours from 9 a. m. to 12 noon. Prior to this arrangement, it was necessary to devote a whole day to the examination, as the practical work consumed all of the afternoon of the day the examination was held. We had one candidate who said he had religious scruples on taking examinations on Saturday. After taking this up with the city attorney, the board felt it best to inconvenience themselves and hold an examination on another day in his individual case, than to allow him to bring it into the courts.

In order to grade the experience of the candidate it is necessary for him to file a sworn statement of his experience, which is graded according to the above outline. (See Fig. No. 1). This is another reason why the practical examination was dropped, as we are now grading them upon experience, instead of giving them a practical examination.

The Portland examining board has made a careful study of methods of examining prospective supervising electricians on the technical aspects of their work.

During the time that the board has been in existence there have been examined 299 candidates, 164 passed and 135 failed, making a percentage of 54.2 who successfully passed the examination. Of course, it was necessary when this ordinance became effective to register everyone in the City of Portland who made application and who could show that they had four years' experience, as it would have been unconstitutional not to have so done.

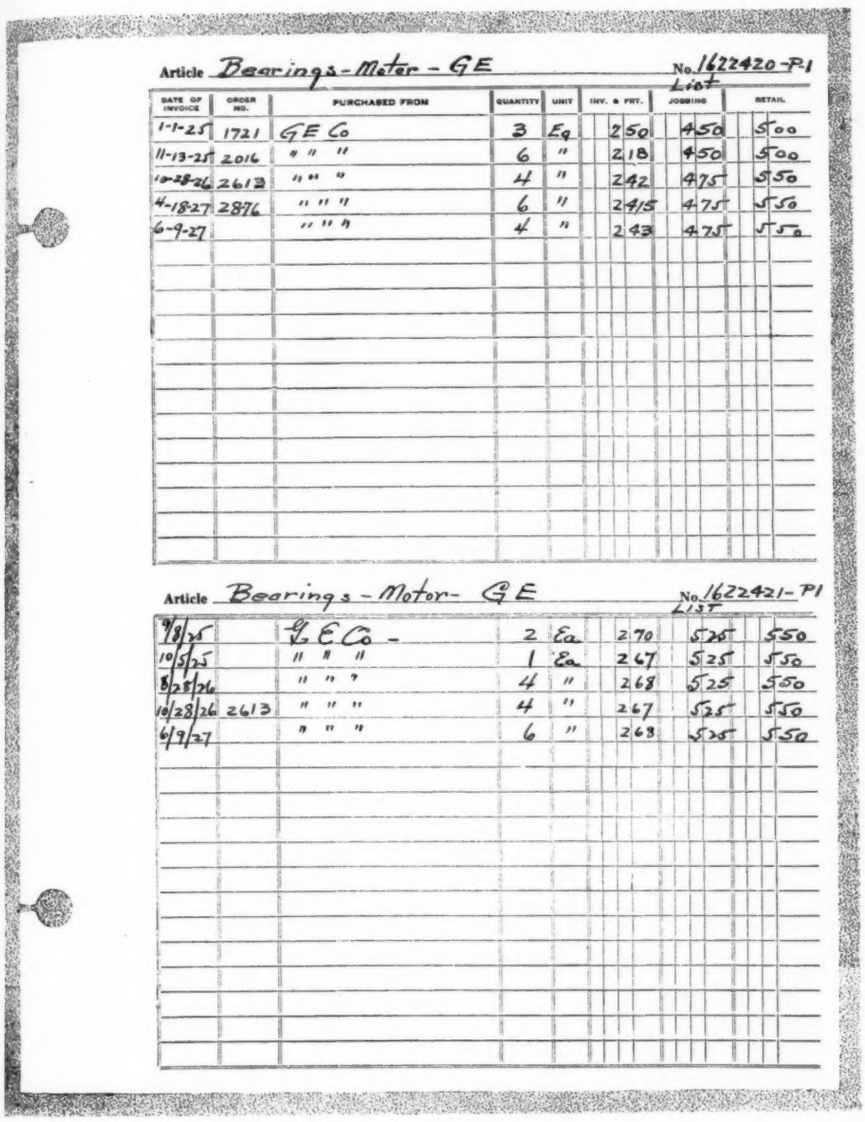
In many cases the supervising electrician is also the contractor, but in the larger firms generally they employ a supervising electrician. From the standpoint of the city electrical department this is a great help for the reason that the correction slips all are handled by the supervising electrician, who makes it his business to get correction.

In the beginning the examining board allowed temporary permits to the various supervisors, expiring at the date of the next regular examination, but this privilege was abused and now no temporary permits are allowed. The way this was abused was for one member of a firm to take out a temporary permit, which was good until the next regular examination. The candidate would not appear for examination and the day after the examination another member of the firm would take out another permit, good for three months.

Some candidates have taken the examination as many as four times before passing. Many times, after failing, candidates have gone to school or taken up courses of study in order to pass these examinations.

One candidate stated that he could not write or spell sufficiently well enough to write the examination in the alloted time, and requested to be allowed to have his wife write it out on a typewriter, as he dictated the answers. This was allowed, and he passed a good examination. This lack of education is one of the reasons for the failure of many candidates and makes it quite difficult to hold written examinations, as good journeymen many times can not express themselves on paper. Still, it is necessary to have some portion of an examination for a permanent record and avoid the charge of favoritism.

Loose Leaf Price and Stock Record System



Article Bearings - Motor - GE No. 1622420-P1 List

DATE OF INVOICE	ORDER NO.	PURCHASED FROM	QUANTITY	UNIT	INV. & FRT.	JOBBING	RETAIL
1-1-25	1721	GE Co	3	Eq	2 50	4 50	5 00
11-13-25	2016	" " "	6	"	2 18	4 50	5 00
10-28-26	2613	" " "	4	"	2 42	4 75	5 50
4-18-27	2876	" " "	6	"	2 45	4 75	5 50
6-9-27		" " "	4	"	2 43	4 75	5 50

Article Bearings - Motor - GE No. 1622421-P1 List

9/8/25		G E Co -	2	Ea	2 70	5 25	5 50
10/5/25		" " "	1	Ea	2 67	5 25	5 50
8/28/26		" " "	4	"	2 68	5 25	5 50
10/28/26	2613	" " "	4	"	2 67	5 25	5 50
6/9/27		" " "	6	"	2 63	5 25	5 50

Sample Page from Price and Stock Record Book

A METHOD of recording prices and freight which keeps a close check on these items and enables the stock clerk to make out bills quickly and correctly is employed by the Georgia Electric and Construction Company, Columbus Georgia. A price book is maintained, one page of which is shown, filled out, with one loose leaf page for each two articles. When a shipment comes in the stockkeeper, who has charge of the price book, receives the material. He has a petty cash box from which he pays all incoming freight, express, or other transportation charges. When the invoices come in they are passed through his hands and are stamped as shown.

The stock clerk has a copy of each purchase order issued and checks prices and extensions of invoices from the purchase order, sending the approved original of the invoice on to the office for second check as to prices charged. The second check is made by the person who signed the original order. The invoice is then passed on to the bookkeeper for entry and payment in time to get the cash discount.

In the meantime the stockkeeper has retained the duplicate of the invoice, added transportation charges and entered the "laid down cost" in the price book under heading of "Inv. & Frt." (invoice and freight). The percentage to be added to cost in order to arrive at the jobbing and retail prices is applied to each item, and the figures entered in the price book.

The stock clerk therefore knows the amount of each item on hand, the invoice price, the transportation charges and the retail price. He prices all sales tickets from the price book. He keeps accurate record of cost of each job,

WATCH DISCOUNT

This invoice must be paid

by .....

Mat'l Rec'd	
Prices	
Extensions	
Account	
Entered	
Vouchered	
Paid	Check No.

whether contract or T. & M., large or small. Tickets and job orders are passed through the superintendent for re-check before billing and then after billing is passed through an executive's hands for final check and approval before mailing.

John M. Flournoy, president of the Georgia Electric and Construction Company, feels that the price book system is the most efficient and simple method of handling the billing and record keeping. "Correctness of invoices," he says, "saves disputed accounts and satisfies customers."

The price book is of the greatest assistance at inventory time, as it contains full price records. Mr. Flournoy comments: "Our experience is that most of the inaccuracy in inventories comes from not having such a price book accurately kept up to the minute. Generally the head of the firm is worn out by supervising counting and then is called on to price and in the meantime the inventory drags and is not correct."

Trucks

Is it cheaper to own them? Is it better to hire them?

Owned Trucks	*Hired Trucks*
1—Cost more	1—Cheaper
2—Fewer delays	2—Many delays
3—Fewer errors	3—Many errors

THERE is a growing tendency on the part of contractors to hire a part or all of their trucking done by commercial trucking concerns. Those who have changed over to this method contend that they are saving money thereby. This seems reasonable but—are there any elements to be considered before making a change. In order to secure the experience of the field in this problem of business management, THE ELECTRAGIST undertook a field survey.

Almost every contractor owns at least one truck or passenger car which he uses for delivering. Of the electrical contractors contributing to this survey 80 percent own one or more trucks, while the other 20 percent hire all their trucking done. Sixty-two percent do all or practically all their own trucking, while 18 percent own one truck or more for most of their work and occasionally call upon the local trucking concern for additional cars when needed. Of those who favor the owning of trucks, one or two use trucking companies for hauling heavy freight and get their jobbers to deliver right to the job wherever possible.

Almost all the electrical men covered in this survey believe that hiring trucks is cheaper than owning them and paying for gas, oil, repairs, depreciation, and a driver. But most of them favor owning trucks because they are always on hand and hence more convenient, quicker, and more serviceable.

The constant complaint of those contractors who hire trucks exclusively is that when they want them they have to wait until a truck is back from some other trip; although cheaper, this is more than made up by the loss of time and efficiency.

A few contractors who own their trucks say that it costs them less than to hire trucking. This should be true, according to the owner of the Glen Park Electric Shop, of Gary, Ind., if the contractor has a lot of delivery work and many widely separated calls where the truck is kept busy most of the time; because, if he hires trucking from an outside company, the contractor has to pay the operating cost plus the truckman's profit.

Electrical contractors operate from 1 to 3 trucks, usually, the ½-ton truck being by far the favorite. One ton trucks are often used by contractors, and 2-ton ones occasionally. Many contractors use a roadster with a delivery box on the rear and this is sufficient to take workmen and small articles to the job as well as to deliver purchases.

The larger trucks can be equipped with useful materials and tools which can be used in repair work and small specialty jobs. The Guarantee Electric Shop of Battle Creek, Mich., operates a truck for use in connection with its sign maintenance service. All necessary equipment for making the usual sign repairs are carried in the truck, as well as equipment for raising and lowering signs, ladders for reaching them, etc. This equipment is always kept in the truck, so it takes no time to start off on a call.

The Ford is the most popular truck among electrical contractors, with the Chevrolet and Dodge slightly less popular. Nearly all contractors use their trucks to transport workmen to jobs.

The costs of owning a truck vary widely, the average being $1224.00 per year. This figure includes gas, oil, repairs, tires, and a sufficient amount for depreciation so that a new truck can be purchased when the old truck is worn out. The cost varies, according to reports from contractors, from $150 to $2160 per year. The latter figure undoubtedly also includes the salary of a driver, while the former figure seems lower than possible to obtain with a truck in regular service.

The Lighthouse Electric Co., Gary, Ind., which keeps very accurate records of its trucks, replaces them every two years. The trucks run an average of 217 miles per month each, using 81 gal. of gasoline and 6 qts. of oil per truck per month. The average repair bill per truck per month is $15.50.

Almost every contractor who hires all his trucking done says it is cheaper than owning trucks. The owner of the McArthur Electric Co., Chicago, Ill., explains: "A regular route wagon goes right by most jobs, which does away with the special trip and therefore costs less than if we owned a truck. Then, too, I might want to send out two jobs at the same time to widely separated points which the truckers can do for me whereas my own wagon could go to only one job at a time."

The trucking rates vary in different cities from $1.00 per hour to $2.50; in some cities the charge is 50 cents a trip. According to these contractors the saving in hiring trucks averages about 40 percent. The advantages claimed for hired trucks are: "No depreciation," "saves special trips," "cheaper," "can have the size truck needed for each delivery job," and "less hazardous." On the other hand, the disadvantages are that drivers are not reliable and make many mistakes, that there are delays and much lost time.

The Spaulding Electric Co., of Detroit, states that it costs them considerably less to hire cartage. "Our truck rates," writes Mr. Spaulding, "are $1.50 per hour. We find in hiring the truck that when we need extra trucking from the cartage company doing our truck-

ing we get very good service at a very reasonable rate. When we operated our own truck, even though we paid much higher wages than the prevailing truck wage, we could not get men who were interested enough in keeping the truck in proper working shape. This ran our costs of repairs pretty high and we decided to hire our trucking done."

Most valuable are the experiences of those contractors who own their own trucks and also hire trucking from outside firms, because theirs is a direct comparison in convenience and cost. Most of those who truck both ways say hiring a truck is cheaper, but they own 1 or 2 trucks themselves because it is more convenient, saves delays, and can be used at any time.

Estimates of the savings effected by hiring trucks range from 20 percent to 50 percent, but all state that hired trucks are inconvenient.

One contractor, the Rolla Electric Co., Joliet, Ill., uses its own trucks to make job deliveries and to transport workmen, hiring trucks for freight hauling and for delivering merchandise.

Another uses ordinary passenger cars as much as possible. If it is necessary to hire some trucking for a particular job, the amount is charged into the cost of the job and not considered part of the overhead.

The Schagane Electric Contracting Co., Flint, Mich., prefers its own trucks "for better service," although it also hires some trucking done, with the disadvantage of time lost in waiting for the truck to come.

Another contractor uses small trucks with light bodies for its small repair calls and for transporting workmen. He has his incoming and outgoing freight hauled by a trucking company with the following scale of charges: 35c. for packages under 100 lbs.; 50c. for 100 to 300 lbs.; 75c. for 300 to 500 lbs.; $1.00 for 500 to 800 lbs.; $1.25 for 800 to 1000 lbs.; $1.50 for 1000 to 1400 lbs.; $1.75 for 1400 to 1700 lbs.

Employees' Injury Compensation

Of interest to electrical contractors is the recent case of Newland V. Bear, 218 N. Y. S. 81, where the question arose as to when an employee who is paid on an hourly basis is to be considered a sub-contractor, and not entitled to damages for injuries received on the job.

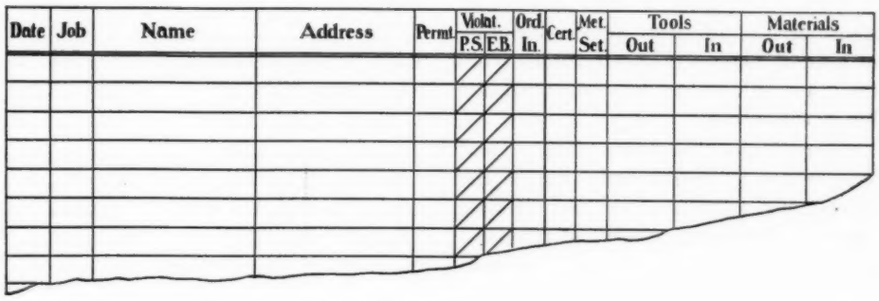
The facts of the case are: The contractor employed a workman and agreed to pay him 85 cents an hour; the employee, although working on an hourly basis had full charge of the completion of the work, as the contractor simply had instructed him to proceed to a certain building and do the work as requested.

It is interesting to observe that the court held the contractor not liable, and said:

"There is no reason to assume from the record that Bear (contractor) contemplated taking charge of the job and giving directions to claimant (workman) as to the method of doing the work. In fact, Bear was not there when the claimant started to work. He arrived shortly thereafter, and stayed only a few minutes. It is not shown that he gave any directions as to the method or means of doing the work on any occasion . . . . No particular time was set for commencing or completing the job . . . . That claimant was to be paid at the rate of 85 cents an hour could make no difference, if Bear did not assume to control the job."

Therefore, it is important to know that the fact that a contractor pays a workman on an hourly basis is immaterial in deciding a case of this nature. The important consideration is: Did the employer control the workman? If so, he is liable. But if the workman is merely instructed by the contractor to accomplish a certain thing, and the latter has no control over the employee or the manner or method of performing the work, the employee legally is an independent contractor, and he is not entitled to recover damages from his employer, even though he is paid on a hourly basis.

Blackboard Shows Details of Work in Progress



H. C. Heidrich, president of the Electric Motor and Repair Company, 264 Halsey Street, Newark, N. J., has prepared a large blackboard to enable him to keep track of work in progress.

In addition to maintaining a motor repair business, the company operates a contracting department, and to give Mr. Heidrich an immediate insight into the progress of all the jobs in work, he has had prepared a large blackboard, pictured here, which gives him all the facts at a glance.

The blackboard is about 10 ft. long and 6 ft. high, ruled to take care of 20 jobs at once. These job lines are horizontal and are placed about six inches apart. Vertical lines are then run down and at the top of the first three sections are indicated the job number, the name of the customer and his address. The next space is headed "Permit," and if the permit to proceed with the work has been granted a check is placed under it on the line of the particular job. The "violation" section has a double rule, "P. S." meaning a violation reported by the Public Service Electric and Gas Company, the local central station; "E. B." means the local municipal inspection department. Each square below is divided into two parts. If a check mark is made on the upper half of the "P. S." section, for example, it means that the utility has reported a violation, and if a corresponding mark is placed in the lower half it means that the violation has been removed. Other squares are provided for a check to indicate whether or not the service has been ordered in, and whether a certificate has been issued on the job. The last two sections are subdivided to show whether the tools sent to the job are still there or whether they have been returned, and the same information concerning materials is conveyed by the last column, also double ruled.

A Progressive X-Ray System of Estimating*

By H. K. BURDICK, Estimator, Newbery Electric Corporation

IT is the purpose of the writer to inform the reader of the consecutive steps advised for the complete routine of a set of plans and specifications from the time they enter an office until the bid is submitted.

First—Upon receiving plans and specifications, immediately count the outlets and segregate them as follows: Number of ceiling, switches, brackets, base plugs, 3-way, 4-way, special, etc., per room or per floor as desired.

(a) There are two advantages in this:

1—After you have checked over these plans eight or ten times for outlets, you have made yourself familiar with the layout.

2—Should plans be called for unexpectedly, you have somewhat of a record of them and also you are able to check your total in item No. 7.

Second—Read specifications thoroughly, and as you do so make notes and list any special items.

Third—If job is laid out, electrically, that is engineered, and specifications are in full detail regarding switchboards, panel boards, etc., immediately call for sub-figures in order to assure ample time.

Fourth—If job is not laid out—

(a) Consider job, whether store, office, apartment, factory or etc., and fix rating of each outlet.

(b) Make layout. (Note—I use Rollin Smith's Handbook for short cuts.)

1. Use red crayon for ½ in.; yellow for ¾ in., and white for 1 in. or over.

2. Place circuit number, wire size and wattage on homeruns.

3. Call light, power and telephone companies regarding special work.

4. Total all wattage, number of circuits, panels, switchboard, etc., and *make notes.*

Fifth—Make take-off of all circuits in inches. (I use a six foot steel tape and yellow pencil and mark each run taken off, so if interrupted, can find where I left off) and list as follows:

Circuit No.	Conduit ½—¾—etc.			Wire No. 14—No. 12		Outlets			
						Ceil.	Bkts.	Sws.	B.P. Etc.
No. 1	10			20		8	1	1	
No. 2—No. 3	4	6			24 8				12

(a) Make table as shown and put down quantities.

(b) Make one line elevation, showing height of base plugs, 10 in., Sws. 4 ft., brackets 6 ft. 6 in., etc. Check same and multiply each respective distance of conduit up or down by total number of outlets.

Sixth—Take off feeders, sub-feeds and other special heavy conduit runs over 1 in. in feet as it is more accurate.

Seventh—Total all items taken off—check outlets with first count. Total all conduit and wire taken off in inches and multiply by constant of scale, as ¼ in. by 4, ⅛ in. by 8, which will then total in feet. Add a percentage for loss in wire and conduit and then make grand total of all conduit and wire including feeders, subfeeds, etc.

Eighth—Transfer from this sheet to price sheet, segregating all items as conduit, wire, and boxes.

(a) Use red check mark when transferring.

Ninth—Price materials.

(a) Place cost of material to each item before making any extensions.

(b) Should have received all sub-bids and special prices by now. If not, call and list them.

(c) Extend all prices one operation.

Tenth—Place labor units to each item before extending, then make extension, one operation.

Eleventh—Total wire, conduit, material and labor separate.

Twelfth—Add inspection, carfare, expense, insurance, etc., and job factor and total all items. We now have a complete estimated total cost of job ready for final "mark up".

A record should be kept of each job, classify it and file list of bids and any other information which might assist you in a future estimate.

* From "The Estimator."

Campaign for Better Wiring

A DIRECT-BY-mail campaign to promote better wiring, which at the same time advertises the electrical contractors who specialize in Red Seal wiring, is planned by the Minneapolis Electric League. The illustration shows the first of the circulars which will be mailed monthly to 1,000 architects, builders and prospective home owners. The style of the circulars will remain the same, but the copy will be different each month.

"WE'RE PUTTING IN ELECTRIC LIGHTS"

HAD you been building a home twenty-five years ago, you would have made that statement with great pride, and rightfully so.

In a few years we have traveled far in the improvement of wiring to keep pace with the science of lighting and the many uses of electric service, because without proper wiring, electric service is less satisfactory.

You can realize satisfaction in the home which you are building only if you are able to make convenient use of the electric appliances—only as you can change the arrangement of the lamps as often as you desire—only as you make electricity a servant who follows or precedes you from room to room, ready at every point to light your way and lighten your labor.

Home wiring is hidden away behind walls and under floors, which necessarily causes much annoyance to alter or extend if for any reason your wiring has failed to meet your demand. Hence to enable the full convenience of electric service, adequate wiring should be installed at the time the home is constructed.

Baseboard plugs, so-called because of their location in the baseboard, have given way to the convenience outlet which may be placed where the demands of convenient service dictate,—in wainscoting, walls and board. It is highly recommended that you install many of the double duty type.

It is, therefore, important, that you consult a competent, reliable contractor, allow him to make an adequate wiring layout for your new home; or if you prefer call the Electrical League office and their residence wiring expert will gladly check your plans. The League services are free, simply call Geneva 3972.

The circular is 6 1-2 in. by 7 in. and folds to 3 1-2 in. by 6 1-2 in. It is printed in black on blue stock. The cover on the first one reads: "We're Putting in Electric Lights!" and the back page contains the league members who are resident wiring contractors, endorsed by the league as follows: "The contractors listed below we know to be competent and reliable craftsmen, using only materials recognized by the National Board of Fire Underwriters."

Estimating Methods---XV

Job Expense
Small Job Management Problems
Analysis of Operations
Check Against Estimate Records

By ARTHUR L. ABBOTT
Technical Director, Association of Electragists, International

THE conduit for the bell system is partly exposed and partly concealed. The quantity is small and it would be a waste of time to split this into two or three parts to figure the labor; the unit for exposed work is used and is applied to the total length. It is usually found that almost as much labor is required for pulling in No. 16 or No. 18 rubber-covered wire as for pulling No. 14 and the labor unit for this operation is therefore set down as 6 hrs. per 1000 ft. Labor data applying to bells, pushes, etc., will be discussed in a later installment.

The conduit for public telephone service and house telephone systems is practically all exposed work on wood. In addition to the time allowed on the conduit four terminals should be figured, these occur in the service run where there are no outlet boxes. For a small quantity of special cable such as that used for this telephone system, the labor may be approximated by using the labor unit for a rubber-covered cable of about the same weight per 1000 ft. The 12-conductor lead covered cable specified weighs approximately 450 lbs. per 1000 ft. which is close to the weight of No. 0 rubber-covered. For a 100 ft. run of No. 0 Table 6 gives 28 hrs. per 1000 ft. The house system is common talking selective ringing. For an intercommunicating system of this type the installation labor per station may be figured as 1.2 hrs. plus .2 hr. x number of stations. There are three stations: 3x.2 hr.=.6 hr., therefore the time allowance per station is 1.2 hr. + .6 hr. or 1.8 hr.

To complete the estimate on the small store building discussed in Chapter XIV, all totals from the pricing sheets should be brought forward and entered on a recapitulation sheet, Form 5-E. This form was illustrated in the July issue and the method of using it was fully explained.

The items of miscellaneous labor, non-productive labor and job expense must be added on the recapitulation sheet. The total estimated time so far in 586 hours. Twelve hours "miscellaneous" should be sufficient, this is to cover various small items which may not have been included in the main estimate. The total productive labor is then 598 hours. Applying the rule of 3 percent of the productive labor up to the first 1000 hours, the handling material and lost time allowance would be 18 hours, which appears to be a reasonable figure. If any time spent in traveling must be paid for, this should be added to the other non-productive items.

The job expense is easily computed. It will probably include in this case a permit or inspection fee, compensation insurance, cartage, and some carfare.

If we assume that the contractor's annual volume of business is $60,000, that his overhead expense averages 31 percent of his total expenditures for labor, material and job expense, and that the cost of labor, material and job expense for this job amount to a total of $1,600, the overhead on this job as indicated by a suitable sliding scale would be about 25 percent of the prime cost, or $400. If the contractor does not understand the reason for using a sliding scale but applies his average percentage in every case, he will be very likely to lose this job, other things being aqual. 31 percent of $1600 is $496, or $96 above the figure given above, and after a profit is added his bid will be at least $100 higher than that of his more intelligent competitor who uses the other method.

An interesting problem came up in connection with this installation. As actually installed, the work varied slightly from that shown on the plans reproduced in the August issue and included some additional equipment for counter and display case lighting, also some temporary lighting. Using the methods and data which have been explained, the total labor for all work except the temporary lighting was estimated as 623 hours. The contractor who did the work reported a total of 880 hours. 50 hours may be deducted from this as a fair allowance for the temporary work, leaving a net of 830 hours, as compared with the estimate of 623 hours.

When the actual labor on a job considerably exceeds the estimated labor, this fact cannot by any means be taken as conclusive evidence that the estimate is wrong. In fact, if the estimating is done properly, an excess of the actual labor over the estimated labor is strong evidence of faulty job management.

In order to find out what was wrong in this case, the plans were revised to show the work as it was actually done, and the plans, specifications and a carefully checked list of the material required were sent to four men with a request that each estimate the labor. The results were as follows:

Estimator	Total Hours
No. 1	737
No. 2	529
No. 3	507
No. 4	660
No. 5	623
Average	611

No. 1 is an estimator for a large organization which is probably too large to handle so small a job with efficiency. No. 2 is a smaller contractor who does some work of this general class. Some errors were evident in the figures submitted by this man, otherwise his total would have been higher. No. 3 has installed 11 jobs very similar to this one, all for the same owners and under plans and specifications made by the same architect. On account of his familiarity with the special requirements this man should be able to make a considerable saving in the labor, and he should be able to estimate the labor very closely. No. 4 is a good estimator and is a contractor who handles large work and does considerable small work as well. The last estimate is

based on the figures illustrated in the August issue, modified to cover the changes and additional work.

Fair Estimate

These figures would seem to justify the conclusion that 623 hours is a very fair estimate of the labor for this job, assuming that the contractor has not previously done work under the same general specifications. This time is just slightly above the average for five estimates. Estimator No. 3, having completed 11 jobs very similar to this one has become a specialist in this particular type of installation, and assuming that he has followed the work closely and has kept adequate cost records, he and his workmen have gained a familiarity with this type of job which makes possible a considerable saving in labor; also, he knows positively what the labor cost should be on a job of this particular type.

The actual time reported, 830 hours, is clearly away out of line; the work should have been done in about three-fourths of this time.

Management of the Small Job

The full value of careful estimating will never be realized by the contractor until he comes to regard the estimate as a standard set up for the labor on the job and takes the necessary steps to see that the estimated labor allowance is not exceeded.

On the store building under discussion there was apparently a loss of about 200 hours of labor which could have been avoided. At $1.25 per hour this would amount to $250. If $200 is assumed as the estimated net profit on this job, a saving of $250 would mean more than doubling the net profit. What doubling one's net profits for the year would mean is left to the imagination of the contractor.

There is just as great an opportunity on the small job as on the larger one to effect a saving through efficient job management and the methods of effecting this saving are much simpler and much easier to apply on small work than on large work.

The list of operations given in the table is first made up. These are so chosen as to make it a simple matter for the workmen to record their time separately on each operation. The total estimated time is then split up between these operations, and the total hours allowed for one operation is divided by the number of units to find the estimated time per unit.

	OPERATIONS	ESTIMATED Total Hours	TIME Hours per Unit
1.	Branch circuit conduit work in basement	141.44	1.30
2.	Branch circuit work, 1st and 2nd floor	128.53	1.53
3.	1 in. and 1¼ in. conduit	27.31	10.10
4.	2 in. service conduit	16.72	28.00
5.	Installing cabinets	12.0	2.40
6.	Pulling No. 14 and No. 12 wire	70.70	7.10
7.	Pulling No. 8, No. 4 and No. 3/0	17.17	16.37
8.	Installing and connecting service switch	5.70	5.70
9.	Installing and connecting panelboards and time switch	41.51	
10.	Installing switches and receptacles	23.95	.33
11.	Installing show window equipment	31.77	
12.	Drop cords and ceiling receptacles	26.20	.40
13.	Fixtures and fans	24.75	.52
14.	Bell work (all except conduit)	8.18	
15.	Telephone work (all except conduit)	9.73	
16.	Handling material	18.00	
17.	Lost time		
18.	Miscellaneous	12.00	

Operations 1 *and* 2. The branch circuit work in the basement, being of a different class of construction from that on the 1st and 2nd floors, should be made one operation. There is so little work on the 2nd floor that this is best included with the first floor in operation No. 2. The men will work more efficiently if so far as possible they work continuously on one floor until it is completed, and if they follow this plan it will be easy to make the time records.

The total estimated time for the lighting branch circuit work in the basement is taken from the estimate sheet No. 3. A part of the conduit work for the bell system and practically all of the conduit for the telephone system is to be in the basement and will be installed along with the lighting conduit. Adding together the times estimated for these three items the total for operation 1 is 141.44 hours. There are 109 outlets to be installed, therefore the time per unit is 1.3 hours per outlet.

Conduits

For the lighting conduit work on the first and second floors and the balance of the bell conduit, operation 2, the estimated time is 128.53 hours. There are 84 outlets and the unit time is 1.53 hours per outlet.

Operation 3. The 1 in. and 1¼ in. conduit will be installed at the same time and it would be difficult if not impossible to separate the labor in the time record, therefore these two sizes are included in one operation. The total is 27.31 hours, taken from estimate sheet No. 4. The proper unit to use here is 100 ft. of conduit. There is a total of 270 ft. and the unit time is 10.1 hours per 100 ft.

Operation 4. There is a day's work for two men on the 2 in. conduit and this does not parallel the runs of smaller sizes and so can properly be made an operation by itself. The estimated time as per sheet No. 4 is 16.72 hours, there are 60 ft. and the unit time is 28 hours per 100 ft.

Operation 5. For most efficient work, two men should undertake to install the cabinets and should continue at this work until it is completed. It will then be a simple matter to record the time. The estimate, sheet 4, is total time for installing cabinets and panelboards and this must be split into two parts, which requires a short calculation using the following data:

Labor installing cabinets only, in hours per terminal of the panelboard which the cabinet is to contain.

Size of terminal on panelboard—amp.	Hours labor on cabinet per panel board terminal
30	.10
60	.15
100	.25
200	.43
400	.60
600	.95

Applying this data, the total cabinet labor is found to be 12 hours and the time per unit is 2.4 hours per cabinet. It should be remembered that no time is included here for any work on conduit; all labor for connecting conduit to cabinets is included in the conduit items, in the form of pipe entrances and pipe terminals.

Operations 6 *and* 7. The No. 14 and No. 12 wire are classed together as one operation, total time 70.7 hours, time per 1000 ft. 7.1 hours. Labor on each

of the three larger sizes cannot conveniently be kept separate in the records because there is so small an amount of each size and it is therefore best to consider pulling all large wire as one operation. The total time is 17.17 hours, there are 1050 ft. and the unit time is 16.37 hours per 1000 ft.

Service Switch

Operation 8. The service switch will first be mounted and at some later time will be connected. The time record on each part of the operation will probably not be very accurate, but the total time is a comparatively small item and a small error in the records will not be important.

Operation 9. The time computed for cabinet labor is deducted from the estimated time on cabinets and panels to find the panelboard allowance. The labor on the time switch is added in with the panelboard labor because it is too small an item to make a separate operation.

Operations 16 *and* 17. While handling material and lost time have been lumped together in the estimate, it is important to separate these in the labor records and each is therefore made a separate operation.

The remaining operations need no comment.

The job has now been completely analyzed or split up into its component parts.

Planning the Job

In planning the management of the job it is first noted that the total estimated time is 616 man-hours. If the entire job is done by two men this is equivalent to 308 hours per man, or 38.5 days for the team of two men. If the working time is 44 hours per week it should take two men exactly 7 weeks to complete the work.

The builder should be interviewed and asked to name as nearly as possible the date on which the building will be ready for the roughing-in to start, the number of days after that date when the lathing will begin and when the steel ceiling work will be started, and the date of final completion.

From the analysis sheet it is a simple matter to find the approximate time estimated for each division of the work as follows:

	Days for two men
Roughing-in conduit and setting cabinets	20
Pulling wire, installing panels, installing switches and receptacles	10
Show window work	2
Fixtures and drop cords	3
Completion of bell and telephone work	1

Based on this data and the information secured from the builder, a time schedule for the job should be made up, showing the approximate date on which each main division of the work will be started and the number of men required at that time. The purpose of this is, of course, to enable the contractor to be fully prepared for the work.

An important part of the preparation is making layouts or working drawings. These should be clear, complete and worked out with much care. The layouts may be made on the architect's blue-prints with colored pencil, but it is far better to make new drawings in pencil on a good grade of tracing paper and have these blue-printed. A blueprint can be easily traced if it is laid on a piece of plate glass lighted from beneath by three or four small lamps.

The materials needed for each part of the work should be carefully listed and arrangements made so that they can be delivered promptly when needed. The right equipment of tools must be ready and all tools must be in good order.

The man on the job who is in charge should be given a typewritten list of the operations, including the estimated total time and time per unit for each, and should be instructed to make out special daily time slips showing the time on each operation. On so small a job as this, there is little use in making records of the quantities of material installed each day, except in the case of the branch circuit work. On this class of work the number of outlets installed each day should be reported. It is much easier, more accurate and serves the purpose better to count the outlets installed rather than to keep a record of the feet of pipe installed.

Data

Data from the daily time reports should be entered every day on record sheets kept in a loose leaf binder in the office. A separate sheet should be used for each operation. On the branch conduit work it will be well to compute each day the actual time per unit up to date, and compare this with the estimated time per unit. For other operations the total actual time should be checked against the total estimated time whenever one operation is completed.

It is hardly necessary to say that as the work progresses any excess of the actual time over the estimated time should be investigated immediately. It is also important to enlist the cooperation of the foreman of the job in devising more efficient methods on all operations. If any considerable saving is made on any class of work, careful notes should be made of how this was accomplished so that the performance can be repeated on future work.

It is particularly important to carefully watch the records of lost time. Most of this loss is avoidable, and when it occurs the reason should be ascertained, so that the mistake will not be repeated.

When this system is applied on a large job lasting several months, continuous records are kept showing the saving or loss on the labor on each operation, and inefficient methods brought to light by the records can be corrected at once. On the small job, on most of the operations no reliable check can be made until the operation is completed, and if the record shows too much labor, nothing can be done about it, on that job. But the knowledge acquired can be turned to good account on the next job of the same kind and thus can be of just as much value as in the case of the larger class of work. Furthermore, the setting up of labor standards is in itself very likely to increase the rate of production and is one of the essential conditions of consistently high efficiency.

Women to Study Electricity

Through cooperation with the women's committee of the National Electric Light Association, Columbia University will offer a three weeks' short course on electricity and household electrical equipment. The course is given under the direction of Dr. Lynde, head of the department of physics.

The course requires attendance five days a week. Besides lectures, two hours a day will be spent in testing household electrical equipment in the laboratory. The laboratory work, in addition to tests on appliances, includes making lamp cords and iron cords, repairing irons, fuses and other parts, run household motors, take them apart and assemble them.

A Successful Plan for an Electrical Convention

By EARL N. PEAK,
President, Iowa Association of Electragists

FOR the last two or three years we have been holding exceedingly successful meetings under a unique plan which might be followed by groups anywhere. The day before the state convention of Iowa electragists, central station men, manufacturers, electrical wholesalers, and contractor-dealers is to be held, the members of the executive board hold an all day meeting to prepare for the convention. Everything is made ready in advance so things are certain to go off smoothly. The following day the convention opens and all the delegates hold a joint meeting with addresses until the middle of the afternoon, when all the organizations except the contractor-dealers are excused. Each group then holds a meeting by itself and discusses any business it may have to take up while the representatives are gathered together.

After this short recess the meeting is reconvened and the officers make their reports, telling what has been accomplished during the past year and what matters should be taken up by the convention. Thus each of the delegates knows what is going on and what the officers and committees are trying to do.

Committees

The following morning, instead of continuing the regular convention meetings, with speeches, as usual, the entire convention is divided into committees. The standing committees, Legislative, Trade Policy, Finance, Ways and Means, and Membership Committees, and also the Resolutions Committee, act as the foundation for enlarged committees, to one of which every delegate is assigned. Each committee then meets in a special room in executive session and discusses all problems presented to them.

Anyone who has been sent as a delegate to the convention who wishes to take up any subject may refer it to the proper committee, in writing if preferred. Thus the timid delegates who would not want to get up in a large meeting and present a problem, or who would not want their home town competitors to know what plans they advocated, can present ideas in writing. The subject is then discussed by the members of the committee concerned and, if it seems advisable to work it into the business of the convention, the committee drafts a resolution which is sent to the resolutions committee, then sitting in executive session.

Earl N. Peak

If the resolutions committee agrees, it is O. K.'d and passed on to be presented on the floor of the convention. If not approved, the chairman of the originating committee may be called in to give his views and then it may be approved.

Saves Argument

This plan eliminates a lot of unnecessary conversation and argument on the floor, since most of the arguments have been thrashed out in the committees.

In addition to the business program, there is an amusement program for the men and a specially interesting program for women. The women of Iowa, as a result of good programs, have become more and more interested in attending the conventions, bringing many more men delegates to the meetings.

Billing Methods

SHOULD bills be detailed or not? That question is frequently brought up when contractors get into discussions. For the small contractor, F. Meyer, of the C-M Electric Co., New York City, would answer: "Yes, give full details in the bill."

Mr. Meyer remarks: "I feel that the customer may want to check me up and if I bill him by items he can do so very easily. He will invariably find that the billing is correct and by looking at his contract he can check the prices. This method I believe to be good in a small business. In a large business there may be no time for the detail work required."

Idaho Ordinance Has Unusual Feature

An ordinance recently passed by the city council of Twin Falls, Idaho, requiring all electrical contractors to be licensed and bonded, also contains the following unusual section.

"Section 3. All electrical wiring, machinery, apparatus, appliances, matters or things of every kind and nature hereafter installed, constructed, repaired, maintained or offered, kept or displayed for sale within the limits of the City of Twin Falls, shall meet the requirements of the National Board of Fire Underwriters and shall be done under the inspection and supervision of the said Electrical Inspector, and in accordance with the rules and regulations as provided by the National Board of Fire Underwriters and the ordinance of said city."

A request for the ordinance was presented to the council by a committee headed by A. E. Dickey, local electrical contractor.

One Form of Prestige Building Circular

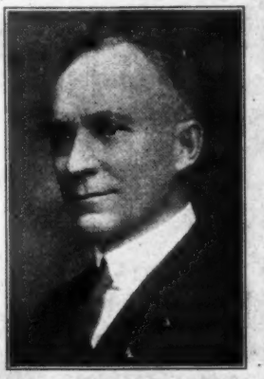
Our Slogan:

IT PAYS TO PLEASE

What's Behind the Slogan?

41 Years' Practical Experience

Courtesy—Service



High Lights in E. C. Bennett's Experience

1868 58 years ago	At the age of 3, while on voyage to England in his father's ship, was shipwrecked and stranded for six months on Sable Island.
1881 46 years ago	Apprentice to a carpenter contractor in Boston for 4 years to learn the trade; received board and clothing and 25c per week for expense money.
1885 42 years ago	Started with the Boston Edison Electric Co.; helped wire the first theatre in Boston to use Electricity for illumination. Studied Electrical Engineering at night school.
1888 39 years ago	Employed by Chicage Edison Electric Co., as foreman in charge of electric wiring of fine residences for the Company.
1891 36 years ago	Employed by Electrical Engineering Department of the World's' Columbian Exposition Co. in Chicago for two and one-half years as General Foreman and wired all the large Exposition buildings for light and power and removed all electrical material at the closing of Exposition.
1894 33 years ago	Started Electrical Contracting for himself in Chicago, Ill.
1897 30 years ago	Received contract to wire Burlington Depot in Omaha and believing this a good place in which to live located here permanently.
	Have wired most of the large buildings erected in Omaha during the last thirty years.
	"Has our work been satisfactory?" "Ask the Architects and our customers." A list of many are on the opposite side.

E. C. BENNETT of Omaha, Neb., has developed an interesting circular which he mails with his invoice, bids, and direct-mail efforts, and which is designed to build prestige for his electrical contracting business. It is a well known fact that proof of experience is useful in convincing the public that a contractor can do a good job. Mr. Bennett secures this effect by giving a resume of his 41 years in practical electrical installation work on the inside of the circular, which is shown in the illustration above.

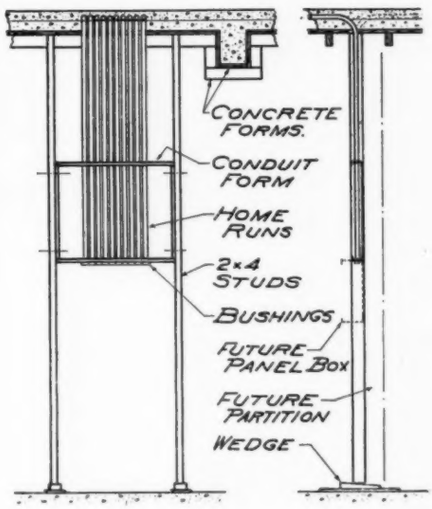
Conduit Form for Concrete Buildings

ON BUILDINGS with a large number of concrete floors, and in which most branch circuit conduits rise from the distribution panel to run concealed in the ceiling above, it has been found economical to make up steel conduit forms as shown in the sketch.

Usually lighting distribution panels are installed on or in partitions which are built after the floors are poured. The panel boxes are not available at the time the conduit is laid, and even if they were it would not be advisable to install them on the ends of the home runs, because they would be damaged by building operations before the partitions were installed upon which to rigidly mount them. Consequently, the home runs terminate in midair.

In order to facilitate work of this kind conduit forms have been devised. These forms are very similar in construction to panel boxes, with the exception that they are comparatively shallow, being about 3 in. deep. They are made up of 10 or 12 ga metal and with flanges on the open side to make them rigid and less liable to damage. Holes large enough to admit the conduit are drilled on opposite sides of the form and are spaced the same as those in the future panel box. Usually enough forms are supplied to take care of two floors, so that while one set is holding the home runs rigidly in place during the pouring of the concrete or the removal of the concrete forms the other set is being used for work on the next floor.

The conduit forms are bolted to two 2 in. x 4 in. wooden studs. This assembly is then wedged between the floor and the ceiling forms and adjusted so that the conduit form is plumb and level. The home runs inserted in the holes are then automatically plumb and



uniformly spaced, and they project through the side of the form enough to permit a bushing to be screwed on. When the bushing is in place the conduit and form make a strong unit which will stand much abuse, even if the struts be removed.

These conduit forms were found in use during the construction of the Salmon Tower Building, a 30-story office building on 42nd Street near 5th Avenue, New York, in which the electrical work was installed by Hatzel & Buehler, Inc., of New York.

Chats on the National Electrical Code

A Monthly Discussion of Wiring Practice and Questions of Interpretation, Presented with a View Toward Encouraging a Better Understanding of the Industry's Most Important Set of Rules

Conducted by F. N. M. SQUIRES
Assistant Chief Inspector, N. Y. Board of Fire Underwriters

Every Little Bit Helps

The weak part of a reinforced or extra braided flexible cord is usually found at the socket or attachment plug. Very few cords that are not connected at the factory to the attachment plug, are connected so that the braid or reinforcing enters the plug cap. This is a weak spot in the cord, and being more flexible than the braided or reinforced part, cracks the copper strands and wears the insulation away where the outer protective covering has been removed.

Some manufacturers make rubber attachment plug caps in which the rubber sheathed cord is made up at the factory with the rubber cap. Another had added a cord grip to both socket caps and attachment plug caps. This cord grip is no freak device, such as some of the electrical jokes that we see. They are substantial cadmium plated clamps that grip the cord on the outside of the socket cap and attachment plug cap. Cord clamps are devices that the industry has needed ever since a piece of cord entered a socket or plug.

GEORGE WELMAN.

Motors in Bakeries

Motors on dough-mixing machines and for other purposes in bakeries are generally a sorry mess. The motors for the dough mixers are usually installed on the floor under a platform, where they receive little, if any, attention, and are subject to dust accumulation. This kind of an outfit must have been designed by a baker, as surely no electrical engineer would be guilty of such a poorly arranged outfit.

Our advice to purchasers of electrically driven machinery for bakeries is to specify that the motors, starters, switches and fuses must be enclosed in dust tight cases or boxes, and that the motors be located above the floors.

It might be well to call the manufacturers' attention to the fact that the boards over the motor may hide some of the dirt, but flour dust will fall through and clog up the air ducts in the motors. Perhaps the manufacturers of bakery equipment have never heard of "air jacketed" motors, and manufacturers of the latter type of motors have never taken the trouble to get in touch with the makers of bakery machinery. If the motor manufacturers do not tell the bakery machinery people what they need in the line of dust proof apparatus, how in the world do they expect the people to find it out. Of course, a motor salesman may not convince a manufacturer in a week, neither may he get an order every day to cover expenses; but if he succeeds in six months in convincing a manufacturer of dough mixers that his line of dust proof and readily accessible motors are the proper motors to use, his time is well spent. He may rely on us for help. We know that flour dust is explosive.

GEORGE WELMAN.

Locknuts

Did you ever see the locknuts on a line of individual fused switches, say twenty or more mounted on a wall, all fit nice and snug, and make a good bond between the conduit and the cabinets? I have never seen this done; there are always a few of the conduits that enter the boxes at an angle, and the locknuts do not make good surface contact with the cabinets. The surest way to get a good bond is to use a grounding type bushing and bond all the conduits together with these bushings. This is not a Code requirement, but we think it should be done with all conduits larger than one inch.

We do not see how two locknuts are going to make any better contact with the cabinet walls than a single bushing and a single locknut would make, if the conduit enters the cabinet at any angle but a right angle. Any inspector knows that locknuts never make perfect bonds. He also knows that a surface contact between conduits and boxes may ordinarily be one square inch or even more, and this will carry enough current to blow the fuses without overheating, but there are times when large currents have caused heating and even fires. These cases may be far apart, but why take a chance when a few extra dollars for grounding bushings may prevent one fire that will cause more damage than several years' supply of grounding bushings will cost.

GEORGE WELMAN.

Electric Range Switch

"Is it necessary under the Rules of the National Electrical Code, to install a disconnecting switch within sight of an electric range?"

This is an interesting question because it touches the economic, practical and safety sides of an installation problem which has been somewhat difficult to explain to the satisfaction of the several interests concerned. I have answered it a number of times and the effect of my answers have been interesting to me. Recently I asked an inspector if he was insisting upon the installation of a disconnecting switch within sight of a range, and his answer was characteristic of one who never reads. His answer was, "Yes! I compel the lighting company to install a switch on every range." When I requested him to show me a rule which would justify such a requirement, he confessed that he could not, but, nevertheless, he expressed himself as being out of harmony with the Code.

Before answering this question, I would like to relate an objection made by another inspector, against installing a switch in a location removed from within sight of the range.

This inspector refused to approve of

the installation of an electric range without a "master switch" attached to it. The single-pole switches for the individual units were provided, but the switch controlling the entire range was located three floors below. His contention, as I recall it, was, in the event that a pan of grease was boiling over and on fire, the individual switches could not be reached, and, as the range was not consuming an excess of current, the fuses or circuit-breakers protecting the circuit could not function. Time would then be lost in reaching the "master switch" located in another part of the building.

I raise the point as to the ability of any one to reach a "master switch" attached to the range should a pan of grease be blazing. Then, again, I seriously question the experience of the inspector with grease fires. Extinguishing a fire, or the heating element which had ignited the grease, would not cause the grease to cease to burn. The best medium to apply would be sand or flour, the location of the "master switch" having no influence in an experience of this character.

Objections

The objections which have come to me against locating the switch within sight of the range are of a two-fold nature, economic and esthetic. I would submit, in connection with the latter, that in an artistic, up-to-date kitchen, with a white tile wall, an objection, most positive in nature, would be faced should we insist upon installing the modern externally operated disconnecting switch, with its accompanying black enameled cabinet on the white tiled wall. I fear, also, we would experience a grave difficulty from the economic point of view, in convincing a prospective user of a range that we must have this disconnecting switch within sight of the range.

Let us lay aside our personal tastes and see just what the Code provides in connection with this live and interesting question. In other words, "Let the Code Decide."

In Article 1602, Paragraph D, of the 1923 issue of the Code, there was a specific statement that each complete heating appliance of more than 1200 watts total capacity had to be controlled by an indicating switch located "within sight of the appliance and readily accessible.

The 1925 Code, 1602-E, omits the words "within sight of the range.". In reading this rule the general impression seems to be that the meaning is implied that the "master switch" shall be readily accessible to the location of the appliance, an impression I find myself unable to accept, because the Code makes no such statement, either direct or implied, and I am also unable to understand just how any authority enforcing the Code can, with reason, insist that this switch be located at the appliance as long as there is a switch somewhere on the circuit.

In the further consideration of this interesting problem, let us lift the curtain of experience and view, briefly, the provision made for tomorrow. When you will have received the 1928 issue of the National Electrical Code, you will note, among other provisions, a modern provision, the product of experience, for the installation and safe use of these highly practical appliances. The provision referred to, follows:

1928 CODE—ARTICLE 1603
SWITCH OR CONTROL METHODS

"A. Each appliance rated at over 1650 watts shall be controlled by an indicating switch, not a part of the appliance, and which disconnects from the appliance all undergrounded conductors of its supply circuit or a single approved attachment plug and connector receptacle of approved rating may be used in lieu of a switch. The location of such control means shalls be as follows:

(1) It shall be readily accessible to the operator of the appliance.

(2) In other than dwelling occupancies it shall control only the appliance.

(3) In multi-family (more than two) dwellings a switch shall be within the apartment or on the same floor as the apartment in which the appliance is installed, and may control lights and other appliances.

(4) In two-family dwellings a switch may be outside of the apartment in which the appliance is installed, but must be readily accessible. This will permit an individual service switch for the apartment to be used, provided it is accessible to the user of the ap-appliance.

(5) In single family dwellings, the service switch may be used for this purpose."

Attachment

I would like to call attention to the wording in the first sentence of paragraph A, that the controlling switch must "not be a part of the appliance," as the question has been raised, in a constructive manner, as to the reason for this restriction, it being the general practice in some communities to attach the controlling switch to some part of the appliance. The same sentence also provides that this controlling switch must disconnect "from the appliance all ungrounded conductors of its supply circuit."

Should the controlling switch be a "part of the appliance" or be attached to the appliance by the one making the installation, how would it then be possible to disconnect all of the ungrounded conductors, as required by the rule? It might be, under some possible and very probable conditions, highly desirable to disconnect the ungrounded conductors from the appliance, as suggested in the rule.

Why?

There has been another question, recently asked by the management of one of our largest public utilities, which I think is worthy of consideration and an answer. It is this:

> "Just what would be accomplished by installing the control switch within sight of the appliance, and what possible need would it supply?"

In a relatively recent conversation with the general manager of an aggressive and progressive public utility, I was told that his company's files showed but one instance where the controlling switch, located within sight of the range, had been used. The family of one of its consumers was to be away for a protracted period and it was desired to disconnect the appliance and, at the same time, retain the service for lighting purposes, there being a service switch, at the point of service entrance, for the entire installation.

Inasmuch as this utility has a great many such appliances connected to its lines, this single experience seems to be without a possible reason for insisting that the controlling switch be "located within sight of the appliance." You will recognize that the supply circuit, leading to the appliance, would be, if properly installed, protected by fuses or circuit-breakers, and for the purpose of disconnecting service from the appliance much greater assurance would be gained for the consumer should the supply circuit be disconnected at this point, providing, of course, there was no controlling switch where the supply circuit began, a reasoning with which the management of the utility was in complete accord.

THOMAS HENRY DAY.

The Electragist

Official Journal of the
Association of Electragists—International
S. B. WILLIAMS
Editor

Turning the Key

This is the last issue of THE ELECTRAGIST. Next month our readers will receive ELECTRICAL CONTRACTING, a brand new magazine with which THE ELECTRAGIST will be consolidated.

The move is in step with the modern trend of business. Smaller units are becoming parts of larger organizations. With more resources the larger companies can do greater things than the small independent units. The new paper, ELECTRICAL CONTRACTING, will therefore open to its readers a wider appeal and interest than has been possible in THE ELECTRAGIST.

In closing the forms of this last issue we can't help feeling that editing THE ELECTRAGIST has been a most interesting and satisfying job. Our position is much the same as that of a family moving from the old comfortable home to the new home they had just built. They are looking forward eagerly to the new modern home, but just the same, when it comes time to turn the key in the door of the old place, that had meant home for so long, many memories will come bobbing up and for a moment a bit of home-sickness.

For more than a quarter of a century the Association has published this magazine each month. For the first twenty-three years it was published almost exclusively for the members. In 1924 it expanded its field to include all electrical contractors.

In this period THE ELECTRAGIST has come to mean something to the electrical contractors of North America. It has made friends in every state. And it has made friends because the policy of THE ELECTRAGIST has always been to champion the cause of the electrical contractor, to make clear to the other branches of the industry the true status of the contracting branch, to encourage the contractors by helpful leadership rather than discouraging criticism.

Perhaps one reason why the contractors have liked THE ELECTRAGIST is because we have liked the contractors. We have met them in the South, and in the North; we have met them in the East and in the West. We have met them at work and at play. Almost invariably our experience has been that they are eager to learn, that they are interested in what others are doing, they are unselfish and friendly. How can one help liking a bunch of men like that?

In the past four or five years THE ELECTRAGIST has seen much progress made in industry relationships, code work, standards, installation practices and business procedure that have improved the economic position of the contractors. In a number of these movements it has been our pleasure to take a leading part.

It has always been our belief that a trade magazine is in a position to have a bird's eye view of its industry, and seeing situations should fearlessly guide and mould opinion to the point where action is taken.

We have made mistakes, of course, but they were honest ones, and they always come from trying to do things and not from trying to run away from problems.

And now as we are about to turn the key in the lock of the old place, we thank all of our friends for the help they have given us in making THE ELECTRAGIST the outstanding paper in its field. As our latch string was always out in the old home, so it will be in the new. ELECTRICAL CONTRACTING will be every bit your friend that THE ELECTRAGIST has been.

New Building Market

According to the weekly statistics assembled by the United States Department of Commerce, new building contracts have been falling off badly of late. They hit a high during the last week in July of $31,795,000 daily. During the second week in September the daily average was but $15,520,000.

If the rates for money continue as high as they have been during the past six weeks even this last figure will be shaved.

About Christmas time the electrical contractors will begin to feel the full effects of the present low building market.

Through the Dealer

At the St. Louis Convention last year the electragists were told about the successful plan of the San Joaquin Light & Power Corporation of Fresno, Calif., for increasing load by encouraging the local dealers. This year at Chicago the convention was told how the Boston Edison company had discovered the secret of successful load building by improved dealer opportunity.

It has been our contention for years that the greatest good would come to the electrical industry in increased load and appliance sales through a dealer industry that was en-

couraged rather than discouraged by unmeetable competition. In a way one cannot blame the power companies for being impatient when generating capacity is available. Load is needed, and the more the utilities grow the greater is going to be their appetite for load.

Their only mistake is in thinking that they could do the whole selling job unaided. In their eagerness to dispose of energy consuming devices they allowed their eyes to stray from the real objective and to remain focused only on the means to the end. In other words, most utilities have not been building load or creating demand; they have merely been doing an over-the-counter appliance business. This is evidenced by the fact that they have concentrated on devices costing a lot of money, but using very little energy.

There is no logical reason why the power companies should retire from the merchandising business if they can sell at a profit. Their experience in their own stores should help them to appreciate the problems of the independent dealer and cause them to help him.

Certainly a growing number of successful dealers could only have one result, and that to increase the sale of energy consuming devices.

Boston and Fresno are satisfied that the dealer is a real load builder. It might be worth while for dealers in other cities to bring those plans to the attention of their local utility manager.

Code Published

The first printing of the 1928 National Electrical Code has been distributed. It does not carry the approval of the American Engineering Standards Committee. Local ordinances which are based upon Code when it is an American Standard may not put the 1928 changes into practice until this approval has been secured.

Ordinarily there is no difficulty in securing the approval of the Standards Committee quickly, but this year the National Electric Light Association was unwilling to accept the new grounding rules as mandatory, preferring rather that a choice between the old and new rules be permitted over a short period.

The matter will undoubtedly be satisfactorily adjusted before the next meeting of the Standards Committee and approval as an American Standard given. The delay, however, means that almost a year will have elapsed since the 1928 rules were adopted by the Electrical Committee before they can be enforced generally.

In view of the fact that the securing of approval as an American Standard is so necessarily wrapped up in proceedure it was perhaps a good thing to have this difference of opinion in order to demonstrate the necessity for unanimity of opinion in the beginning. It shouldn't be difficult for the electrical industry to agree on fundamentals in the Code. So far, however, the different electrical interests have gone into the Electrical Committee meetings without having come to an agreement with each other, and sometimes even with a "chip on the shoulder."

One would think that the Article Committee meetings would furnish the time and place for getting together, but somehow they haven't always done so.

Each of the electrical interests is represented by an association. What is to prevent these associations from formulating their plans and proposals, and then jointly discussing them in principle, leaving the detail to the Article Committees?

Contractors and the League

What should be the relation of the electrical contractor to his local league or board of trade? Should he join as an individual or as a member of a local contractors' organization? Should league members form a section for their association work or should such work be done independently of the league? These questions are constantly arising.

The primary function of the league is to promote the use of electricity by the public. It is a business building organization. As such it should be supported.

There is no evidence, however, that a league or board of trade can act also as an association for the contractors. The work of the league and the work of a contractors' organization are entirely different. The league is composed of members from every branch of the industry. The league, therefore, in the case of a difference of opinion could not take up the cause of the contractors against another group.

There are innumerable problems that only a contractors' organization, separately set up from the league, can effectively handle. The contractors should never become so much a part of a league as to lose their identity and effectiveness as an organization.

Who Is To Take Their Place?

With increasing frequency we note the depletion of the ranks of the well known electrical inspectors. A month ago death took Allen M. Schoen, chief engineer of the Southeastern Department. This month we report the retirement of F. A. Cambridge, city electrician of Winnipeg. Mr. Cambridge was in harness for thirty-five years.

The electrical industry was fortunate to have attracted to it the enthusiasts who for so many years have held the post of chief inspector in our important cities. While probably the poorest paid executives in the entire industry, they have held the respect of all.

It can't be many years before all of the "old guard" are are gone. What are we doing to replace them? These men upon whom we have relied for so many years have stuck to their work in spite of the low pay because it was in their blood. Younger men will not replace them today for so little reward.

The men who hold these jobs will be looked to by the industry for leadership in Code matters, for the building of better trade relationships, locally, for a lot of calm, logical and judicious thinking. What is being done to insure the industry that its inspection departments will continue to be in the hands of such competent men?

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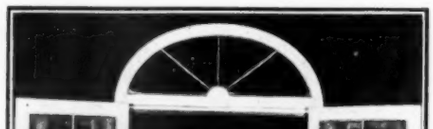
(C) designates exclusively Contractor-Dealer organization.
(L) designates an Electrical League.

SEPTEMBER ACTIVITIES

Christmas Window Displays

THE Society for Electrical Development has prepared a large Santa Claus window and counter card in six colors for use in connection with Christmas window displays by contractor dealers. The merchandise helps this year were prepared as a result of the approval of the industry given to last year's material, as expressed by orders for over 30,000 selling pieces.

In addition to the window display and counter cut-out, there is being made available a complete portfolio of merchandising suggestions and a manual on conducting outdoor lighting contests.



Cambridge Retires

F. A. Cambridge, city electrician of Winnipeg, and connected with the inspection department of that city for the past thirty-five years, announces his retirement. Upon publication of the announcement, more than 300 members of the electrical industry of Winnipeg tendered Mr. Cambridge a testimonial dinner, with addresses of regret and appreciation by Mayor Swain of St. Boniface, Acting Mayor Pulford, Winnipeg, and W. A. Straith, for electrical industry.

Oregon Electragists Hold Convention

Members of the Oregon Association of Electragists held their second annual convention in Portland August 18. The morning session included an executive committee meeting, and a contractor-dealer business meeting. In the afternoon Frederick S. Cook spoke on the Oregon lien laws; Charles Pryal gave a window lighting demonstration; Wesley S. Grasle talked on the subject of estimating.

The annual banquet was held in the evening, followed by dancing. Franklin T. Griffith made the principal address, with Roy C. Kenney acting as toastmaster. The jobbers and electragists held a golf tournament on the following day.

New officers are: Frank L. Robinson, president; C. D. Garcelon, vice president; J. R. Tomlinson, secretary; and Roy C. Kenney, Basil Witzig, D. D. Van Fleet and Tran Alfrey, members of executive committee. The convention committee included Harold Parrott, B. Huenergard and W. H. Emrick.

Boston League to Broadcast

Announcement has been made that the Metropolitan Electrical League of Boston will advertise the advantages of the league twice a week over the radio. The items to be covered are: The reasons for the league; the public will be told to look for the league seal; they will be told to ask electrical men if they are league members before doing business with them; they will describe and sell electrical appliances, repairing and wiring; the announcer will ask listening women to write for the names of league members in their territory, which will be supplied by the league.

Engineers Elect Officers

The American Institute of Electrical Engineers recently elected R. F. Schuchardt, Commonwealth Edison Company, president; and E. B. Merriam, H. A. Kidder, W. T. Ryan, B. D. Hull, G. E. Quinan as vice-presidents.

Pittsburgh Goes to Five-Day Week

It was announced by the Electrical Contractors' Association of Pittsburgh that beginning September 1 forty hours constitutes a full working week in Pittsburgh, to be worked eight hours per day. No work is to be performed on Saturday except on maintenance and repair work, and in cases of emergency, when straight time will be paid for Saturday morning; and under existing conditions where no temporary light man is required during the week, he shall not be required on Saturday morning.

This provision for a five-day week is for a trial period of 90 days, from September first.

Pennsylvania State Contractors to Meet October 8-10

Members of the Pennsylvania State Association of Electrical Contractors and Dealers will meet October 8-10 for their annual convention and business meeting. A varied and interesting program of addresses and entertainment is announced. Members will register Monday morning, October 8, just before the opening session, when the Mayor of Pittsburgh and W. V. Pangborne, president of the association, will make addresses. After an industry luncheon, a business session for contractors and contractor-dealers will be held, with a discussion of merchandising methods of public utilities. In the evening an open forum is planned for members of the jobbing, manufacturing and contractor branches of the industry.

On Tuesday there will be business sessions, with officers and committee reports, and a discussion of registration, license and other proposed legislation affecting the electrical trade.

A discussion on standardized wiring installations, with final committee reports, resolutions and election of officers features the business sessions on Wednesday. In the evening will be held the annual banquet, with entertainment and dancing, to complete the program.

Industry Conference on Grounding

Representatives of all Branches to Meet to Iron Out Disagreements

AN industry conference on grounding will be held in New York November 15 and 16, according to a bulletin sent out by A. R. Small, chairman, electrical committee, who will preside at the conference.

The scope of the conference was indicated by the executive committee, N. F. P. A., in the note to following Article 9 of the 1928 Code: "Note—The whole subject of grounding of equipment and appliances in interior wiring systems, including methods of grounding by means of auxiliary conductors, what fixed equipment should be grounded and whether portables in domestic establishments need to be grounded, and if so, how, is to be submitted to a general conference during 1928 with a view to a special report to the next meeting of the electrical committee and appropriate action for the next edition of this code."

The conference will consider the following, and its conclusions will be reported to the February, 1929, meeting of the electrical committee:

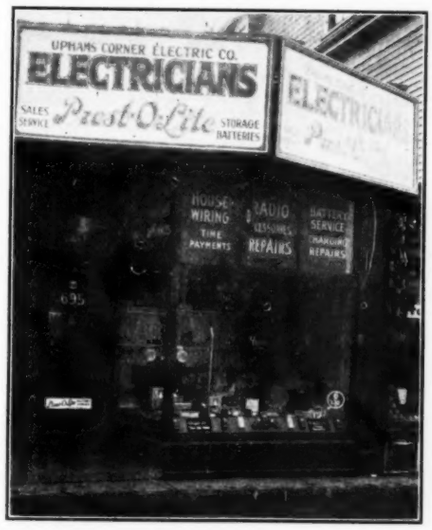
1. *Types of ground electrodes*
   (a) A continuous metallic underground water piping system
   (b) A system ground conductor
   (c) A continuous metallic underground steam piping system
   (d) A continuous metallic underground gas piping system
   (e) The metal frame of the building
   (f) A local metallic underground piping system, metal well casing and the like.
   (g) An artificial ground whose electrode consists of driven pipe, driven rod, buried plate, or other devices approved for the purpose.
2. *Grounding of services*
   (a) At the building
   (b) At the pole
   (c) Other methods
3. *What kind and what parts of circuits are to be grounded—voltage limitations, etc.*
4. *Grounding of fixed equipment*
   (a) What must be grounded
   (b) What may be grounded
   (c) What need not be grounded
   (d) What should not be grounded
5. *Shall grounding wire be*
   (a) Insulated as for live wires
   (b) Covered for mechanical protection
   (c) Run bare—isolated or in combination with live wires
   (d) One of the circuit wires
6. *Grounding of portables*
   Industrial establishments
   (a) What must be grounded
   (b) What may be grounded
   (c) What need not be grounded
   (d) What should not be grounded
   Domestic establishments
   (a) What must be grounded
   (b) What may be grounded
   (c) What need not be grounded
   (d) What should not be grounded
7. Insulation of portable devices as a substitute for grounding
8. Definition of "conductive location" and how far shall rules recognize it
9. Shall the rules require that the resistance of ground connections be measured and kept within certain limits?
10. Program to be followed to recognize findings of conference

Industrial Campaign Again

A series of mailing pieces to promote the sale of industrial lighting equipment, continuing the campaign started last year, has been begun by the Electrical League of the Niagara Frontier. The mailing pieces include printed broadsides on the efficiency of good lighting and data sheets. This league has also sent out wall charts to architects and builders telling room-by-room the requirements of the Red Seal specifications. The chart is designed to be hung above the drafting table to be consulted when the lighting and wiring layout is being made, so that nothing necessary for a Red Seal will be omitted.

New Electrical Store

T. H. Kelley and R. H. Bradford have opened a new electrical store in Dorchester, Mass., which they call the



Uphams Corner Electric Co. This firm moved to the new and better location from the former store, where it had been in business for several years.

What the A. L. E. A. Does

A long list of accomplishments of the Artistic Lighting Equipment Association is announced by G. P. Rogers, managing director, in a bulletin to members. The association, begun in July, 1926, is responsible for the development of a trade survey of the lighting equipment industry and has completed the following tasks:

Held trade shows and conventions; established a collection department collecting 71 per cent of all claims; established a material exchange and an employment exchange; an arbitration department; a credit bureau; a publicity department; a uniform cost formula; a sales promotional campaign; co-operative work with other associations, and bulletins on standardization.

Inspectors Convene in Denver

Opening with a spectacular "autumnal fiesta," the International Association of Electrical Inspectors convened at Denver, Colo., on September 12. Under the direction of L. A. Barley, chairman of the convention committee, the annual convention of the inspectors was full of practical information and replete with exciting entertainment.

Committee members were, in addition to Mr. Barley, R. G. Gentry, finance; Julius Pearse, entertainment; George E. Lewis, publicity; E. L. Garihan, hotel; Dean Clark, reception; James Adams, transportation; John Malpiede, badges and decorations, and Mrs. L. A. Barley, ladies' entertainment.

Uniform Service Requirements

The Metropolitan League, Boston, has recently formed a service connection committee for a discussion of the possibilities and advantages of uniformity of central station service requirements.

New Wiring Code in Toledo

Members of a committee in Toledo are considering a new wiring code for the city, an attempt being made to standardize wiring installation rules along the lines of the new National Electrical Code. Members of the committee are: Thomas Meagher, chairman; Charles A. Baldwin, Walter S. Bissell, Frank L. Lucas, Gil Southern and Joseph Wright.

Denver Activities

Consideration of three plans for development of electrical business marked an important session of the advisory board of the Electrical League of Colorado. The three activities are:

A convenience outlet and portable lamp sales activity in which contractors and the utility will co-operate.

A commercial and window lighting campaign for the latter half of October and the first of November.

A tie-in with the home modernizing movement.

Home Modernization Growing

The Home Modernizing Bureau of the National Building Industries reports great growth of the movement all over the country. Local home modernizing bureaus are being formed in many cities. A permanent organization has been established and a campaign started in Minneapolis, Topeka, Springfield, Illinois, Quincy, Cleveland, Decatur, Bloomington, Atlantic City and Florence. A large number of other cities are considering the plan. In San Francisco an executive committee has been selected to study the plan, which includes Clyde L. Chamblin, president, Association of Electragists, and Earl Browne, secretary, California Electragists.

What Contractors Think of the Red Seal Plan

WESTERN UNION

1928 JUL 10 PM 4 10

CE 387 64 NL 3 EXTRA=
CHICAGO ILL 10

B BADRIAN SOCIETY FOR ELECTRICAL DEVELOPMENT
420 LEXINGTON AVE
NEW YORK NY

GENERAL WIRING INSTALLATIONS ON SOUTHSIDE JOBS IN CHICAGO HAVE INCREASED IN NUMBER OF OUTLETS INSTALLED FROM TWENTY TO TWENTY FIVE PER CENT IN THE PAST YEAR TO OUR MINDS THIS CAN BE DIRECTLY ATTRIBUTED TO BETTER WIRING ACTIVITIES AND THE ELECTRIC ASSOCIATION RED SEAL WORK IN PARTICULAR THESE ADDITIONAL OUTLETS INSTALLED ADD THE SAME PERCENTAGE OF INCREASE TO GROSS BUSINESS AND PROFIT

GEORGE I WINTERS
CHATHAM ELECTRIC CO

WESTERN UNION

1928 JUL 9 PM 5 27

CE 424 59 NL=CHICAGO ILL 9

B BADRIAN=
THE SOCIETY FOR ELECTRICAL DEVELOPMENT 420 LEXINGTON AVE NEW YORK NY

ON ONE OF OUR AVERAGE JOBS THE ORIGINAL NUMBER OF OUTLETS PLANNED WAS ONE HUNDRED EIGHTY EIGHT RED SEAL BROUGHT TOTAL TO TWO HUNDRED FIFTY SIX THE INCREASE IN ADDITIONAL WIRING WAS THIRTY ONE PERCENT AND INCREASED TOTAL COST THIRTY SEVEN AND ONE HALF PER CENT WE HEARTILY ENDORSE THE RED SEAL PLAN AND TALK IT EVERY OPPORTUNITY WE GET=

G DEKKER

WESTERN UNION

1928 JUL 9 PM 7 13

ABB 624 35 COLLECT NL=
CATSKILL NY 9

SOCIETY FOR ELECTRICAL DEVELOPMENT INC=
420 LEXINGTON AVE
NEW YORK NY

RED SEAL ESTABLISHED THE IDENTITY OF THE CONVENIENCE OUTLET IT CREATED A DEMAND FOR THEM ON OLD WIRING JOBS AS WELL AS NEW TO SUPPLY THIS DEMAND WE ARE DOING A NICE PROFITABLE BUSINESS

H N WARDEN

WESTERN UNION

BUFFALO NY JULY 11 1928

B BADRIAN SOCIETY FOR ELECTRICAL DEVELOPMENT
420 LEXINGTON AVE
NEW YORK NY

RED SEAL WIRING ACTIVITIES HAVE ADDED 30% TO 75% INCREASED WIRING OUTLETS IN THE AVERAGE HOME HAS HAD A CORRESPONDING INCREASE IN APPLIANCE SALES AND HAS CREATED MORE ENTHUSIASTIC COOPERATION WITH CENTRAL STATIONS ON SALES OF APPLIANCES

LOUIS WIPPERMAN
WIPPERMAN AND MITCHELL INC

WESTERN UNION

1928 JUL 14 PM 2 56

CA 748 49 NL ROCK ISLAND ILL 14

B BADRIAN=SOCIETY FOR ELECTRICAL DEVELOPMENT INC
420 LEXINGTON AVE
NEW YORK NY=

HERE IN THE TRICITIES THE RED SEAL WIRING PLAN INCREASES OUR HOUSE WIRING BUSINESS FORTY PERC INSPIRES THE CUSTOMERS CONFICENCE AS BEING THE MINIMUM STANDARD ESTABLISHED BY NATIONAL PRECEDENCE RESULTING IN GREATER SATISFACTION BY THE SUPERIORITY OF THIS MODERN WIRING PLAN THE CHEAP HOUSE WIRING CONTRACTOR IS LARGELY ELIMINATED=

C R ROBBINS

WESTERN UNION

YOUNGSTOWN OHIO
JULY 16, 1928

B BADRIAN SUPERVISOR RED SEAL PLAN SOCIETY FOR ELECTRICAL DEVELOPMENT 420 LEXINGTON AVE NEW YORK NY

OUR EXPERIENCE DURING THE PAST TWO YEARS PROVES THAT RED SEAL WIRING ADDS FROM TEN TO TWENTY FIVE OUTLETS AND A HEAVY SERVICE TO THE WIRING LAYOUT FOR EACH JOB AND INCREASES THE COST OF THE WIRING APPROXIMATELY THIRTY PERCENT IT ALSO STIMULATES THE SALE OF FIXTURES FLOOR LAMPS TABLE LAMPS AND APPLIANCES

THE STANDARD CHANDELIER COMPANY
JOHN ESKAY PRESIDENT

WESTERN UNION

1928 JUL 9 PM 9 33

NAB 450 58 NL COLLECT
2 EXTRA=CHATTANOOGA TENN 9

THE SOCIETY FOR ELECTRICAL DEVELOPMENT
420 LEXINGTON AVE
NEW YORK NY=

ANSWERING YOURS SIXTH STOP HAVE FOUND RED SEAL WIRING MATERIALLY INCREASES PROFITS AND CUSTOMER SATISFACTION STOP THREE JOBS PICKED AT RANDOM ADDED THIRTY THREE LIGHT OUTLET STOP SEVENTEEN SWITCHES STOP FORTY RECEPTACLES STOP SIXTEEN THREE WAYS STOP ADDED PROFIT TO US THREE HUNDRED DOLLARS ROUGHLY STOP RED SEAL SOLID WITH US STOP BEST WISHES FOR CONTINUED SUCCESS

TERRELL ELECTRIC CO
CHATTANOOGA TENN

WESTERN UNION

1928 JUL 10 PM 4 22

CL 71 60 3 EXTRA NL=
CHICAGO ILL 10

B BADRIAN, SOCIETY FOR ELECTRICAL DEVELOPMENT=
420 LEXINGTON AVE
NEW YORK NY

RED SEAL JOBS PROGRESSING NICELY NOW HAVE FIVE SPECULATIVE BUILDERS SOLD ON USING THIS PLAN IN THEIR HOMES RED SEAL MEANS AN INCREASE OF FIFTEEN TO THIRTY OUTLETS IN THE AVERAGE SIX OR SEVEN ROOM HOUSE THIS INCREASE IS CERTAINLY WORTH WHILE AND WE SHALL CONTINUE TO PUT FORTH OUR BEST EFFORTS FOR MORE RED SEAL JOBS=

CHAS OSBERG
RIVERSIDE ELECTRIC CO

WESTERN UNION

1928 JUL 11 PM 3 54

RHA 552 47 NL COLLECT=
ROCHESTER NY 11

RED SEAL PLAN RAISES STANDARD OF ELECTRICAL WORK FOR THE INDUSTRY GIVES THE HOME OWNER A FIRST CLASS JOB FURNISHES CONVENIENCE OUTLETS FOR THE SALE OF ALL ELECTRICAL APPLIANCES IN THE FUTURE AND MAKES MORE PROFIT FOR THE ELECTRICAL CONTRACTOR WE HEARTILY ENDORSE RED SEAL PLAN=

LAUBE ELECTRIC CORPORATION

Electragist Beauty

Miss Ramm

Miss Ramm, stenographer in the office of the secretary of the Electrical Contractors' Association of Youngstown, Ohio, won the first prize as Miss Electragist in the bathing beauty contest held at the Builders' Exchange picnic August 25.

Safety Requires More Outlets

A house or apartment is unsafely wired unless there are sufficient outlets, according to a bulletin of the Department of Gas and Electricity, Chicago. The statement follows:

"One of the most common causes of electrical fires is the misuse of drop cords, particularly in the homes. It is a physical impossibility for the department to prevent the misuse of them in that it would require a house to house canvass to detect violators. Trouble from this source would be practically stopped with more co-operation between wiremen, contractors and architects by which owners could be advised of the advantages of a completely wired job. The department is able to control the situation in regard to preventing the misuse of cords in stores, factories and public buildings on account of the fre-

Contractor is Not Liable

When an Employee is Injured While Disobeying Orders

THE contractor is not liable for injury damages when an employee is hurt as a result of an act in disobeyment of his employer's instructions, it was decided in the case of Von Scoter vs. Megginson, 110 So. 247. In this case, it was disclosed that an employee was seriously injured as a result of the breaking of a cable of an elevator used in carrying material to the upper story of a building. The elevator was not intended to be used as a carrier of men, and the contractor had issued orders for the men not to ride on it. There were ladders for the men to use in going to work on the building and in coming off the building for any purpose. The man who operated the material elevator, in violation of his orders not to let the men ride the elevator, did let some of them ride.

In holding the contractor not liable, the Court said:

"We are also of the opinion that . . . Von Scoter (contractor) was under no duty to the plaintiff (workman) at the time the injury occurred, and that the plaintiff was riding the elevator without authority and without the knowledge of Von Scoter. It is clear that the operator of the elevator had no authority to permit plaintiff to ride this elevator, and his act in so doing was not the act of a master."

quency of inspections made in them. In a dwelling, the inspector rarely sees the job again after he has passed on the original installation. The owner or tenant then has free reign around the house with a roll of lamp cord and some sockets and proceeds to supply the missing outlets that it should have been the contractor's job to install in the first place.

"By the requirements of the code, if any room of a house or apartment is wired for electricity, all rooms must be wired, the whole purpose of which is to eliminate the practice of using cord wiring or other methods of unapproved, uninspected wiring in the remaining rooms which were not originally intended to be wired. A minimum requirement is also in effect in respect to the convenience outlets required, which is that one must be installed in the kitchen, dining room and living room of each house or apartment wired. The electrical requirements of the modern home are such that lighting and convenience outlets should be provided at every possible place where portable lamps or devices such as heaters, curling irons, toasters, irons, vacuum cleaners, washing machines, ironers, dish washers, refrigerators, or radios, might be used.

"On account of the rapidly increasing use in homes of electrical devices which were unknown or were luxuries a few years ago, a greatly increased amount of cord wiring has come into use to make up for the deficiency of outlets provided by the contractor. A lack of foresight in not anticipating the wants and needs of an owner by those in a better position to advise with him, is rapidly bringing about a bad condition of wiring which might otherwise be mutually profitable to owner and contractor and at the same time reduce some of the hazards of unsafe wiring."

Motor Dealers Give Banquet

A "stag" banquet was given by the Electric Motor Dealers Association of San Francisco at the Clift Hotel, June 16, with the representatives of the electric motor and control apparatus manufacturers as its guests. The banquet was presided over by H. T. Adams, president of the association, with Clyde Chamblin, president, A. E. I., as toastmaster.

"Motor Mad, a single phase tragedy put on straight across the line without control," written by Wm. A. Cyr, and acted by members of the Association, was one of the features of the meeting.

The cast consisted of: Lloyd Flatland, Globe Electric Works; K. M. Noble, Buzzell Electric Works; H. T. Adams, Farnsworth Electric Co., and George Katz, Peerless Electric Works.

New Electragists

The following contractor-dealers have made application and been accepted into the A. E. I. since the publication of the last list in the September issue:

CALIFORNIA

Eureka:
Eureka Electric Co.

COLORADO

Denver:
Graveline Elec. Co.

INDIANA

Merom:
Saunders Electric.

IOWA

Bloomfield
The Electric Shop.

MARYLAND

Baltimore:
Elec. Motor Repair Co.

MASSACHUSETTS

Boston:
J. J. Caddigan. (Honorary Member)

MICHIGAN

Adrian:
Budd's Electric Store.
The Electric Service.

Ann Arbor:
J. E. Beeler Electric Construction.

Detroit:
Herman Bischoff.
Connor Electric.
Roy Danner.
Indian Village Elec. Co.
Harry Lightstone.
John Miller Elec. Co.
Southeastern Elec. Co., Inc.
Alfred Stephen.
Turner Engrg. Co.

Flint:
Acme Electrical Co.

Grosse Pointe:
Frank Zeegers.

Ionia:
Weber & Dean Elec. Co.

Kalamazoo:
Central Elec. Co.
R. Cramer Elec. Shop.
Maurice W. Doyle.
Hinckley-White El. Co.
Housel & Pountain Elec. Co.
Snyder Elec. Co.

Pontiac:
F. R. MacIntosh El. Co.
Fred Saner.

MISSOURI

St. Louis:
Columbia Elec. Co.
Ungar Elec. Co.
Victor Elec. Co.

NEW YORK

New York City:
Arthur L. Abbott (Honorary Member)

Rome:
D. A. Humphrey.

OHIO

Cincinnati:
Bertke Elec. Co., Inc.

OKLAHOMA

Enid:
Storrs Elec. Constr. Co.

BRAZIL

Rio de Janeiro:
Francisco de Sa Lessa (Assoc.).

News of the Manufacturers

Plugs and Receptacles

The General Electric Co., Schenectady, N. Y., announces the manufacture of heavy duty, triple pole, polarity plugs and receptacles. They are designed for use with electric ranges, enabling the range to be disconnected and plugged into a new location.

Tumbler Switch

The Bryant Electric Co., Bridgeport, Conn., offers flush tumbler switches with the "On" and "Off" indications on the handles, which

are made broad and heavy. The porcelain cups are shallower than in previous models as the switch mechanism has been simplified. They may be had with luminous handles.

Solderless Connector

The Rattan Manufacturing Co., New Haven, Conn., is making a new model of its solderless connector, known as "The Marr Connector." This connector is composed of an inner brass tube with a set screw, and an outer cap, formerly made of fibre, but now made of molded composition in the new model. The cap is tapered, and the brass part wedged into it. The cap lessens the chance of the set screw becoming loose.

Devices

Pass & Seymour, Syracuse, N. Y., has brought on the market a tumbler switch and surface pilot light combination, catalogued as P. & S. 1820, ready wired, single gang.

When used for remote control, such as in a private garage, the light acts as an indicator. Also it has released for sale a duplex receptacle with bull's eye pilot light. When a connection is made in either receptacle, the lamp behind the bull's eye is lit.

Street Lighting Units

The General Electric Co. has designed a new line of suspension units in which a few standardized, interchangeable parts take the place of many different designs and sizes.

Mica Undercutter

The Ideal Commutator Dresser Co., Sycamore, Ill., is making a new mica undercutter, motor driven, which, it is claimed, can be used without removing any brushes. An adjustable guide is so constructed that only one slot needs to be cut by hand.

Ground Wire Clamp

The Copperweld Steel Co., Chicago, Ill., announces the manufacture of a ground wire clamp designed to encircle the ground rod and grip the grounding wire directly to the driven member. The manufacturer claims that no solder is required, as the wire is flattened against the rod, increasing the contact surface and preventing slipping.

Ceiling Switch

Pass & Seymour, Inc., Syracuse, N. Y., are making a heavy duty ceiling switch for use particularly in commerical lighting units and

units using high wattage lamps in industrial situations. It is supplied with a heavy cord and has a solid or slotted base.

Hand Control Switch

For application where it is desirable to control a magnetic switch at the switch itself, the General Electric Co. has designed two small control switches. These may be mounted in the knockouts of the enclosing case of any starter and are held rigidly in place by a conduit bushing which forms part of the switch. One type is a maintaining-contact type with an action similar to a single-pole, double-throw switch. It is provided with three positions, "hand," "off" and "automatic." The second type of switch is a two-position, momentary-contact switch, provided with the positions "start" and "stop." This is the equivalent of the usual push-button station of the same marking. It is most applicable where starting and stopping of the motor is necessary at the magnetic switch itself.

Lamp Holders

The General Electric Co. is introducing a line of threaded catch lamp holders, the caps, shells and keys of which are made of a phenolic compound which manufacturers claim to be resistant to moisture, corrosion, heat, acid fumes and steam and much less subject to chipping than porcelain. With the threaded catch form of fastening, caps and shells are said to be held together even under excessive vibration or direct strain. A threaded brass ring holds the cap and body together firmly while a lug in the cap engages a slot in the shell, preventing rotation. Interiors are of the standard type used in brass shell sockets.

Fan Cooled Motor

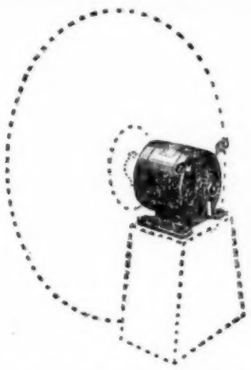
The Cleveland Electric Motor Co. announces the manufacture of a new type totally enclosed electric motor cooled by an electric fan. The ball-bearing type motor is totally enclosed in an inner shell, designed to be dust-proof. Around the inner shell is an outer shell, with air space between. Air is drawn into this space through air holes penetrating the outer shell by a fan mounted between the inner and outer covers.

Rheostat

A new rheostat is announced by Cutler Hammer Mfg. Co., designed to control the speed of small motors and to act as a dimmer on lighting circuits or as an electric heater regulator. The device is of the circular plate type, complete enclosed, small in size, furnished for conduit wiring.

Television Motors

The Bodine Electric Co., Chicago, announces three new motors designed for the use of experimenters and manufacturers for driving television scanning discs. Speed can be varied



25 per cent above or below normal by the use of a rheostat. As practically all television work is done at 1080 r.p.m., these motors are designed to operate 18, 20 and 24-in. scanning discs at this speed.

Circuit Breaker

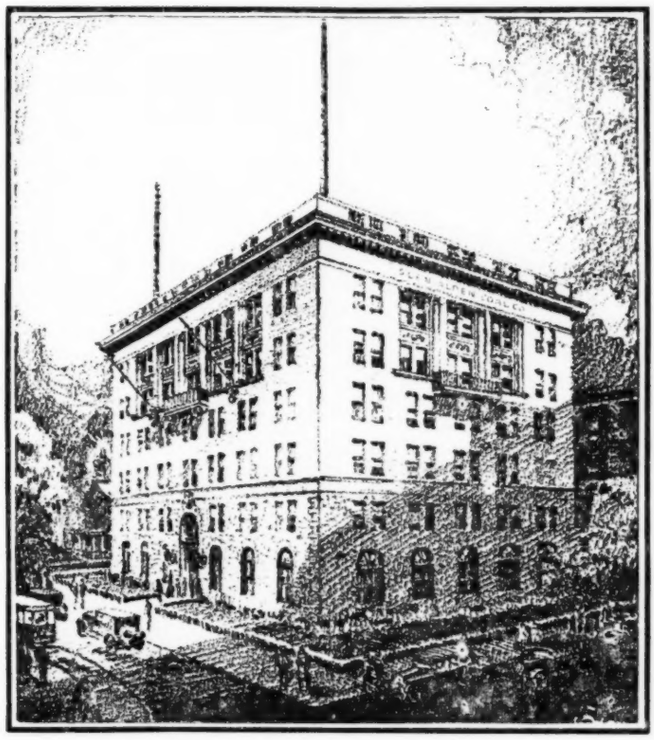
An automatic circuit breaker, designed for use on 125-volt a. c. and d. c. with ratings of 6, 10 and 15 amp. is now being made by General Electric. The device was developed to control branch lighting circuits and small motor-driven apparatus. The opening of the silver contact points due to heating of the thermal element on overload causes all the current to pass through the magnet and trips the breaker instantly.

Tool Rest

Ideal Commutator Dresser Co., Sycamore, Ill., announces a new tool rest, or portable grinder, to be used with resurfacers, for removing long flat spots and eccentricities in commutators.

HAZARD

This building is wired throughout with Hazard Standard (30%) Wire.



Glen Alden Coal Co. Bldg., Scranton, Pa. Kenneth M. Murchison, Architect.

Architects and Electrical Engineers Do Believe in Quality

This building is but typical of the many throughout the country where the architect or electrical engineer has specified the best quality of insulated wire. They realize that the small extra cost of "quality" wire is one of the best investments that can be made.

Better quality wire means better profits for you. In our book on *Electric Building Wire* we are telling the architects and engineers the facts. If you have not received your copy of this book, send for it.

HAZARD INSULATED WIRE WORKS

Division of the Okonite Company

WORKS: WILKES-BARRE, PA.

SALES OFFICES:

New York	Chicago	Philadelphia	Pittsburgh	St. Louis	Boston
Atlanta	Birmingham	Seattle	San Francisco	Los Angeles	Dallas

New Catalogs

The Edison Lamp Works of General Electric Co., has published two illustrated bulletins entitled "Lighting of School and Gymnasiums" and "Street Lighting with Mazda Lamps."

A bulletin issued by the Lincoln Electric Co., Cleveland, O., discusses arc welding installation, interference on multiple operator sets, and economy of power of variable voltage equipment.

The National Lamp Works of General Electric Co., has issued a new price schedule of large Mazda lamps to supersede that dated April 1, 1927.

Bulletin No. 10 of the Hart Mfg. Co., Hartford, Conn., describes remote control equipment.

The Murlin Mfg. Co. has a catalog ready showing many interior and exterior lighting fixture designs.

The Auth Electrical Specialty Co., New York, has published a bulletin describing its telephone systems, and mail boxes.

The Benjamin Electric Co., Chicago, has issued a new bulletin in colors illustrating and describing industrial signals, fire alarms, police call systems, traffic warnings and drawbridge signals.

The General Electric Co. has made available a bulletin dealing with automatic station installations.

The Roller-Smith Co., New York, has issued a bulletin of portable, direct reading, slide wire, ohmmeters.

A new Murlin catalog of interior and exterior lighting fixture designs is ready for distribution.

The Wheeler Reflector Co., Boston, Mass., has issued several new catalog sheets illustrating new material pertaining to industrial illumination.

The Arrow Electric Co., has ready a catalog sheet describing two new ceiling receptacles.

The Diehl Mfg. Co., Elizabethport, N. J., offers a new catalog section describing their motor and exhaust fans, including fractional horse power motors, marine type motors, textile loom motors, and motor generator sets.

Curtis Lighting, Inc., have just issued a set of plates illustrating and describing methods of church illumination. Suitable methods of lighting the auditorium, chancel, windows, pastor's study, stage and gymnasium.

The Graybar Electric Co. has published an illustrated catalog on commercial lighting with tables of lamp sizes and specifications.

The Patrick & Wilkins Co., Philadelphia, has published a bulletin of signal systems including hold up, bank and office alarms, residence and store burglar alarms, interior fire alarms and other like signal systems.

The construction of the Wagner sleave bearings and ball bearings is described in a new bulletin of the Wagner Electric Corp., St. Louis.

Six new loose leaf pamphlets issued by the General Electric Co. describe squirrel-cage induction motors, a travel carriage for automatic arc welders, mill motors, radio telephone equipment for train communication, a magnetic switch and sheath-wire resistor units.

Edwards and Co., Inc., New York, has published a new general catalog of electric signaling devices.

"Groundulets and Other Safety Circuit Devices" has been published by the Crouse-Hinds Co., Syracuse, N. Y. Another bulletin of the same company is "Ground for Safety", answering the questions when, where and how to ground.

The Westinghouse Electric and Mfg. Co. has issued a new price list of ranges and immersion heaters.

The Iroquois Electric Refrigeration Co. announces the appointment of Walter F. Worrell manager of sales. Mr. Worrell was special representative of the company in its Chicago territory.

The "Eagle News" is the title of a new house organ of the Eagle Electric Mfg. Co., Brooklyn, N. Y.

A catalog of signal systems has just been issued by the Patrick & Wilkins Co., Philadelphia.

A new catalog of Taplet conduit fittings has been published by the Taplet Mfg. Co., Philadelphia.

"Electric Commercial Cooking Equipment" has been published by the Westinghouse Electric and Mfg. Co.

The Hart and Hegeman Mfg. Co., Hartford, Conn., has issued a new catalog of switches and wiring devices.

The Fullman Mfg. Co., Latrobe, Pa., announces the appointment of W. H. Beaven, Birmingham, Ala., as southern sales representative.

The Eagle Electric Mfg. Co. announces that Charles F. Copeland will act as office representative in territory east of the Mississippi.

New Factory Buildings

John I. Paulding, Inc., New Bedford, Mass., has completed two new factory buildings and three new kilns. The larger facilities will be used for the manufacture of porcelain sockets, switches and other items of the Paulding line.

The Lexington Electric Products Co., Inc., has erected a factory in Newark, N. J., at 6-26 Chapel St. The sales office remains in New York City.

The Okonite Co. has opened an office at 1808 Allen Bldg., Dallas, Texas.

Personnel Items

On a recent visit to Europe, Maurice A. Oudin, vice-president of the International General Electric Co., Inc., was decorated by the King. He was honored with the Order of Commander of the Crown of Italy in recognition of his good offices in behalf of closer technical and industrial relations between Italy and the United States.

The following representatives of the Packard Electric Co. attended the Electragist convention in Chicago: Howard Johnson and C. J. Rhea of the Chicago office, W. F. Parker, general manager; R. W. Beard, sales manager; and P. E. Cook, chief engineer.

T. H. Bobber has resigned as western sales manager of the Triangle Conduit Co., Inc.

Chicago-Jefferson Fuse and Electric Co. announces the promotion of L. E. Fuller from district sales manager to western sales manager and G. A. Shaver to Pacific sales manager.

Paul B. Juhnke, Commonwealth Edison Co., is chairman of both the electrical section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers.

The Belden Mfg. Co., Chicago, Ill., announce that Wallace R. Lynn, San Francisco, Cal., has been appointed Pacific coast representative.

The Roller-Smith Co., New York, announces the following changes in its sales organization: Texas territory is now in charge of John A. Coleman, 1006 Washington Ave., Houston. Colorado, Utah, Wyoming and northern New Mexico are being handled by H. T. Weeks, Denver, Colo.

J. K. B. Hare has been appointed assistant central station sales manager of the Westinghouse Electric & Mfg. Co. His office is in New York City.

Manufacturers' Notes

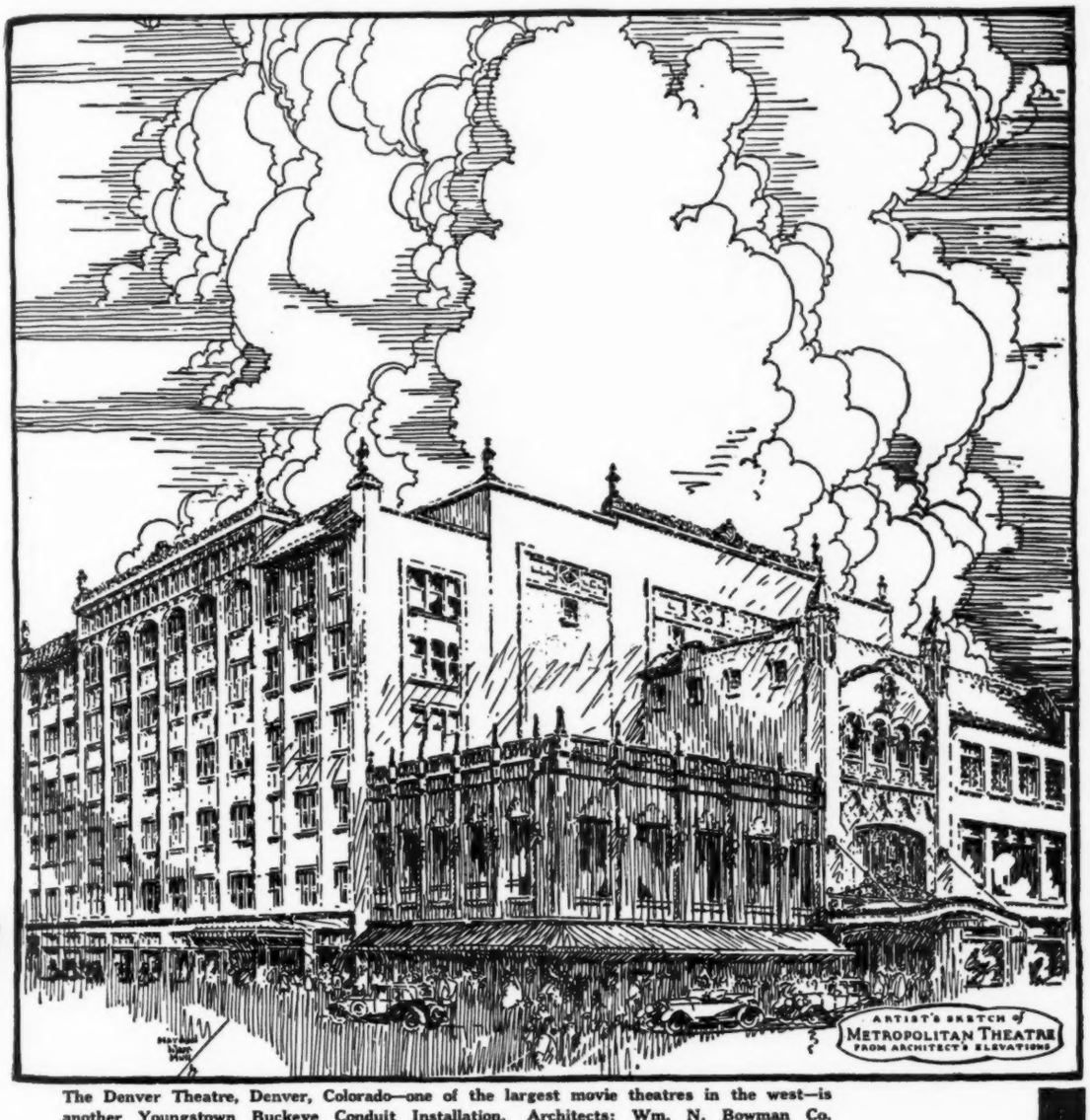
Edwards and Co., New York, announce the opening of a new branch office in 100 Plymouth Bldg., Minneapolis. Mr. V. L. Warren is in charge.

The Quadrangle Mfg. Co., Chicago, has just moved into new and larger quarters at 26 to 32 South Peoria St., a modern, two story building with double the floor space of their former location.

The General Cable Corp., New York, has purchased a piece of land in Mobile, Alabama, as a site for a factory for the manufacture of wire and cable. The General Cable Corp., formed last November, purchased the plants of the Baltimore Rolling Mills, Dudlo Mfg. Co., Rome Wire Co., Safety Cable Co., and Standard Underground Cable Co.

The Okonite-Callender Cable Co. opened an office on July 2 in the Statler Office Bldg., 20 Providence St., Boston, Mass. It is under the direction of Lewis G. Martin, vice-president.

The McGraw Electric Co., Omaha, Neb., has purchased the Clark water heater from the Stoughton Mfg. Corp., Stoughton, Wisc.



The Denver Theatre, Denver, Colorado—one of the largest movie theatres in the west—is another Youngstown Buckeye Conduit Installation. Architects: Wm. N. Bowman Co. Electrical Contractor: Sturgeon Electric Co.

All that Conduit should be

Youngstown Buckeye Conduit embodies every feature essential to any conduit installation. It is **strong**—being made of the finest grade of steel. It is **ductile**—being easily bent to any desired shape, yet without the slightest sacrifice in toughness or strength. It has **clean-cut threads** and good couplings—making its installation on the job easy and speedy. Its electro-galvanized or enamel **coating is durable**—affording lasting protection against time and moisture. In fact Youngstown Buckeye Conduit sets the standard for electrical wiring protection.

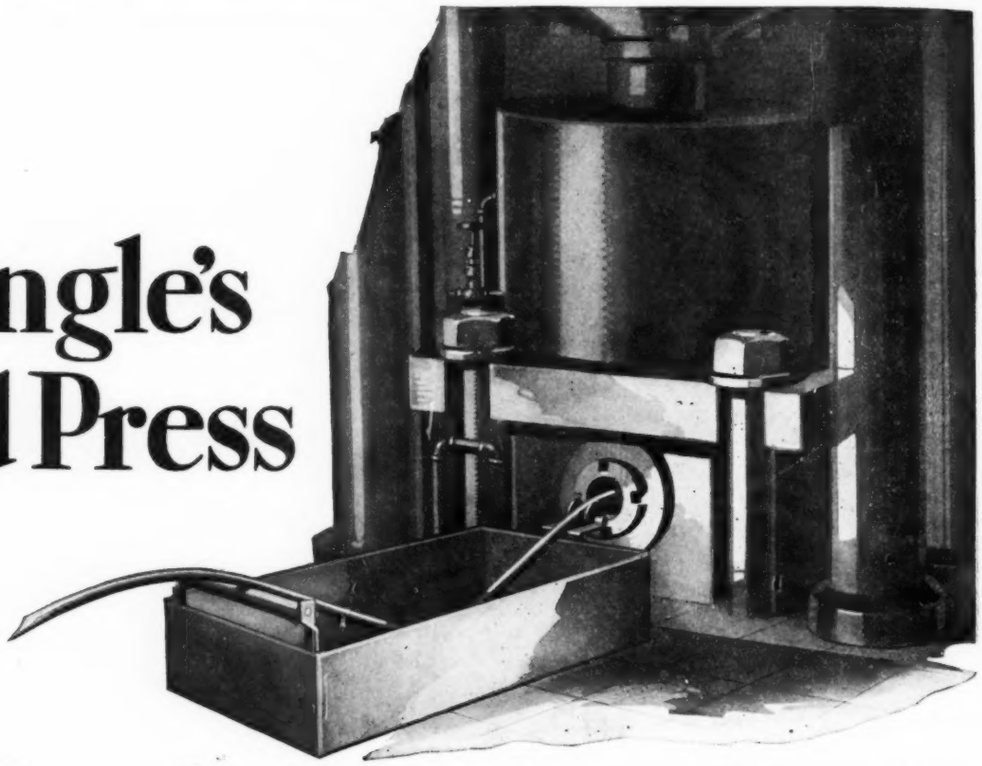
Building after building the country over is proving Youngstown serviceability. Architects unhesitatingly specify it because they **know** its serviceability. Electrical engineers recommend it because they appreciate the construction features which assure permanent protection to the electrical wiring. Electricians prefer it because it is easy to install, and makes a good wiring job better.

Be sure to insist on Youngstown-Buckeye protection for your wiring jobs. Every length bears the combination Youngstown-Buckeye and Underwriter's Laboratories Label for your protection—two marks that insure you a permanent conduit installation.

THE YOUNGSTOWN SHEET & TUBE COMPANY
General Offices—Youngstown, Ohio **Sales Offices in 20 Cities.**

YOUNGSTOWN-BUCKEYE
CONDUIT

Triangle's Lead Press



--a Hard-working Giant

The lead press works with a strength that could smash a battleship as easily as you crack a nut. Yet its work is done with the micrometer accuracy of a jeweler. This is one of the machines dedicated to the job of putting Triangle Quality into Triangle products.

Triangle rubber-covered wire comes from this giant press covered with a seamless jacket of lead, as Triangle lead-encased wire or cable. The thickness of this lead coating is determined by dies and and is kept uniform by exact control of heat and pressure. Then come rigid inspections to make sure that the product is *perfect*.

The Triangle lead press is a hard-working machine, kept busy by the regular production schedule, but not too busy to give special service to customers who need it.

Triangle Products

ARMORED CONDUCTORS
(round, flat, and leaded)

▲

"TRIEX"
(non-metallic sheathed cable)

▲

NON-METALLIC FLEXIBLE CONDUIT

▲

RIGID STEEL CONDUIT

▲

FLEXIBLE STEEL CONDUIT

▲

RUBBER-COVERED WIRE

▲

RUBBER-COVERED LEAD-ENCASED WIRE

▲

TRIANGLE ARMORED CABLE TOOL

TRIANGLE CONDUIT CO., INC.

General Offices: Dry Harbor Road & Cooper Ave., Brooklyn, N.Y.

Factories:
BROOKLYN · CHICAGO · BUTLER, PA.

In Canada:
TRIANGLE CONDUIT CO. Ltd., TORONTO

DUREX

"the Easiest-to-wire" Industrial Lighting equipment

Durex requires only three simple operations to install—(1) contact screws are exposed for ready wiring, socket being quickly fastened to canopy by screws fitting into bayonet holes, (2) cap is screwed on, and (3) reflector is attached with a few twists of the wrist. No washers, lock nuts or yokes are required. Durex construction represents the highest development in scientific industrial lighting!

The popularity of Durex construction was established immediately upon its introduction. The trade demanded Durex not only on the Standard R. L. M. Dome, but on other reflector types as well.

There's a reason, of course—it's the surprising ease and convenience of Durex wiring. All the usual trouble with ordinary reflectors is eliminated—and labor is reduced to a minimum. That means economy—installation and maintenance costs are tremendously reduced.

You can easily get the benefit of this improved lighting equipment—when you're buying reflectors, specify Durex *only!*

DUREX R.L.M. STANDARD DOME REFLECTOR

"H" Group

This unit is used wherever general illumination is desired. It assures a wide light distribution with avoidance of undue glare.

DUREX STANDARD ANGLE REFLECTOR

"N" Group

For side lighting on surfaces that cannot be lighted from above.

DUREX STANDARD BOWL REFLECTOR

"P" Group

Designed for localized lighting and high overhead illumination.

DUREX SHALLOW DOME REFLECTOR

"D" Group

Provides the wide light distribution needed for exteriors. Used for interior lighting where wide spacing is necessary.

DUREX GLASSTEEL DIFFUSER

A highly efficient unit for use where fine operations require minimized shadows. Furnished complete with Durex canopy construction, ready for wiring.

WHEELER REFLECTOR CO., 275 Congress St., Boston, Mass.

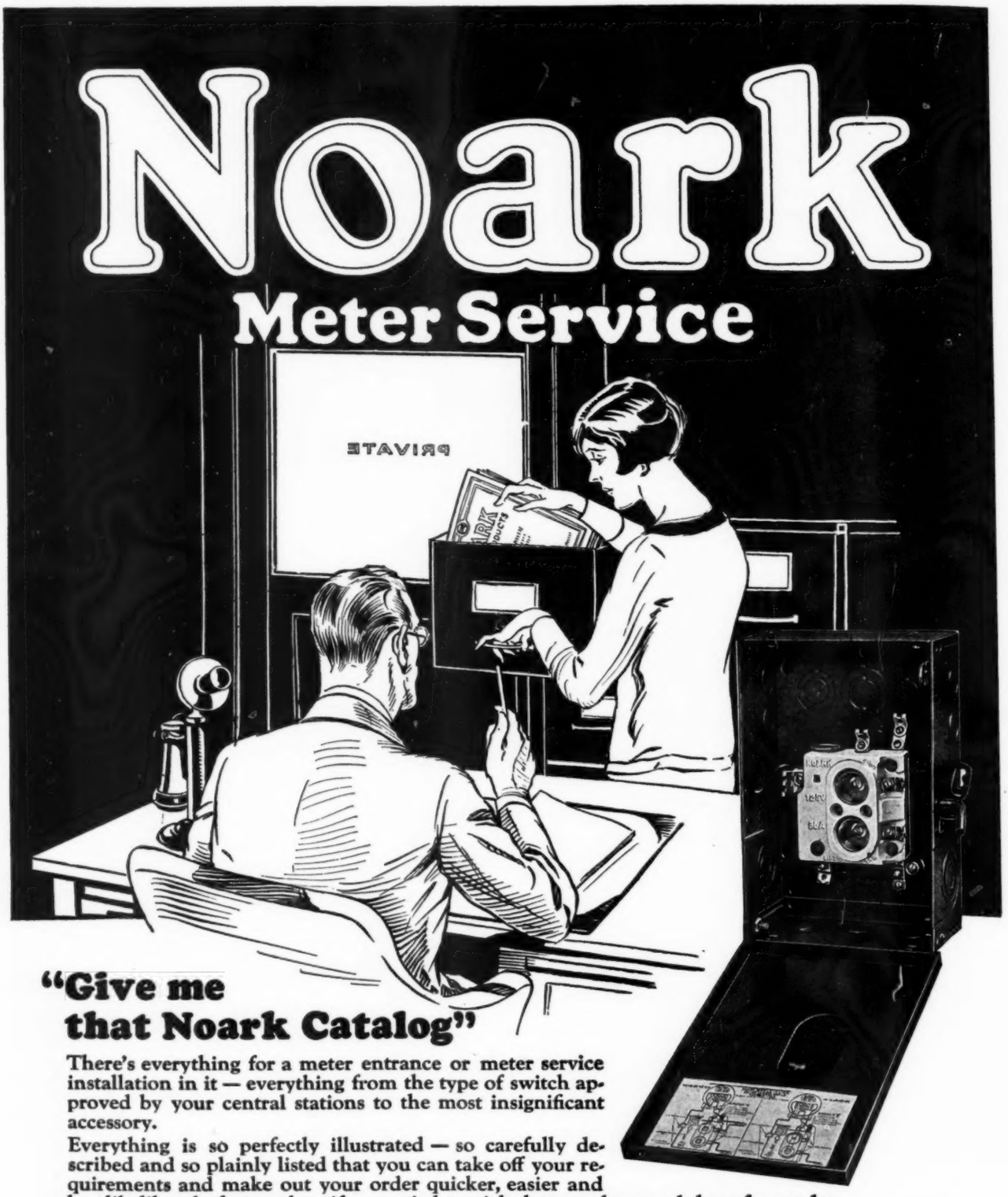
New York Atlanta Cleveland

Sales Offices: St. Louis, Indianapolis, Los Angeles, San Francisco, Seattle
In Canada: Canadian General Electric Co., Limited
Export Department: 77 Warren St., New York, N. Y., Cable Address "PARLECTRIC"

WHEELER REFLECTORS

Noark

Meter Service



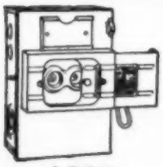
"Give me that Noark Catalog"

There's everything for a meter entrance or meter service installation in it — everything from the type of switch approved by your central stations to the most insignificant accessory.

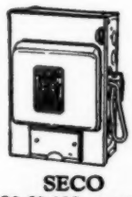
Everything is so perfectly illustrated — so carefully described and so plainly listed that you can take off your requirements and make out your order quicker, easier and less likelihood of error than if you tried to pick them up here and there from a lot of miscellaneous sources.

Another thing, you can save money, too, by concentrating your purchases on Noark.

If you haven't a copy of our new No. 56 Catalog, ask for it.



ACCO
30-60-100 ampere capacity. Load side fuses accessible.



SECO
30-60-100 ampere capacity. All fuses sealed.

COLT'S PATENT FIRE ARMS MFG. CO.
ELECTRICAL DIVISION
HARTFORD, CONNECTICUT, U. S. A.
NEW YORK · BOSTON · PHILADELPHIA · PITTSBURGH · CHICAGO · SAN FRANCISCO 33-8-18

Where gloom and glare were banished by correct lighting.

Put correct lighting on your sales force . . .

You can sell Westinghouse Lighting Equipment in greater volume, as well as increase your sales of other material that is used on every lighting installation, if you will use correct lighting as a sales assistant.

The before-and-after illustrations above show how gloom and glare are replaced by an even distribution of light when an installation to provide correct light is made. Correct lighting is an effective help in producing sales because its results are tangible and its effects can be proven.

For either commercial or industrial lighting, Westinghouse Lighting Equipment, properly installed, will provide correct lighting, and the Westinghouse Illuminating Engineering Bureau will supply information that will enable you to design any lighting installation in accordance with the requirements of correct lighting.

And you can demonstrate what the effects of correct lighting will be when you are working on the sale. Ask the Westinghouse Jobber Salesman about the lighting demonstration set that is being offered and about the instructions for its use that the Westinghouse Illuminating Engineering Bureau provides. With this equipment you can use correct lighting as a sales help that will often turn an inquiry for "a couple of fixtures" into an order for an entire new lighting installation. If you prefer, write for information.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
MERCHANDISING DEPARTMENT, SOUTH BEND WORKS, SOUTH BEND, INDIANA

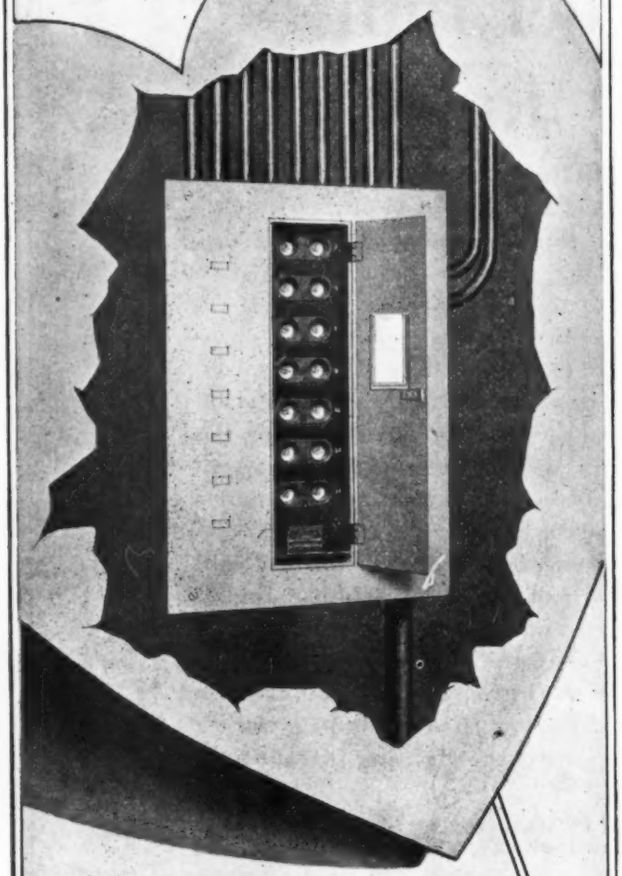
Westinghouse

The Sign of a Westinghouse Electrification Appliances Apparatus Wiring THIS SIGN YOUR GUARANTEE W WESTINGHOUSE ELECTRIC *Westinghouse Dealer*

A=S=E

The HEART of the WIRING SYSTEM

fuse-cabs!



The distribution center... in truth, the "Heart of the Wiring System" ...is permanent and trouble-free when A-S-E FUSE CABS are on the job..... Fuse-Cabs are offered in sizes ranging from two to twenty-four circuits...with and without provision for branch circuit switches...presenting a type for every standard installation.

ALL-STEEL-EQUIP COMPANY
Aurora, Ill.

What good is a time switch unless it is dependable?

SAUTER
Electric Time Switches

have an unmatched record for **dependably accurate performance,** in all climes and on all jobs.

They cost more to make but for this very reason **cost less to own.**

Because they continue to operate on time (without compulsory weekly servicing) they actually do save money for their users.

Consequently electragists install them with profit and satisfaction.

Full Particulars Sent Gladly

R. W. Cramer & Co.
136 Liberty St., New York, N. Y.

"Wadsworth"

Stands for Progressive Leadership in Safety Electric Switches

There is a Wadsworth Switch for every installation.

Pioneer Advocates of Accessible Fuse Meter Service Switches.

Our Motto:
Quality Goods—Prompt Service

Send for Complete Data

The WADSWORTH ELECTRIC MFG. CO. INC.
Covington, Kentucky.

"Boost Your Sales with ABolites"

Today's Stock is Tomorrow's Profits

WHAT you buy NOW largely determines the PROFITS you make later on.

ABolites offer you a Complete Line of High Quality Porcelain-Enameled Steel Reflectors, plus an interchangeable detachable design which enables you to meet almost any requirement direct from stock.

The Five Big Points of ABolites

INTERCHANGEABLE REFLECTORS PERMIT EASY CHANGES AND LOW STOCK INVESTMENT

CORRECT DESIGN AND MANUFACTURE — PRESSED, NOT SPUN

NO RIVETS TO WORK LOOSE

AGE-PROOF HIGH-REFLECTING VITREOUS ENAMEL

PRICE RIGHT

Write for Catalog 107-A.

The ABolite Reflector Co.

2400 East 75th Street, CLEVELAND, O.

RELIABILITY

New!

A *Practical Electrician designed this Hammer*

AN ELECTRICAL mechanic invented this hammer. He designed this tool with a long poll, to reach into tight places, over pipes and outlet boxes, and to make work easier and more accurate.

Knowing that the Evansville Tool Works has for many years supplied electricians and carpenters with tools designed for their special needs, this inventor came to us for help.

The long poll makes it easy to nail outlet boxes. Saves effort. Does a better job.

The results of our combined efforts now makes it possible to offer you this

No. 77 Tested Electrician's Hammer

Nail pipe and conduit straps without tilting hammer. Reach into inaccessible corners.

In this hammer you get perfect balance and excellent craftsmanship. Electricians who have used this tool pronounce it one of the most valuable helpers in their work kit. The handle is made of second-growth hickory, and the hammer head is made of high-quality carbon steel, carefully milled and polished.

Semi-straight claws may be used for chipping joists and for the ordinary jobs of prying and wrecking.

Mail the Coupon

You cannot know the full value of this unusual tool until you use it. Because of the fact that we are asking you to supply us with your dealer's name, we are offering this tool at the very reasonable price of **$2.00.** It will pay you NOW to fill in the attached coupon and mail it today with your post office money order. The cost is only **$2.00,** delivered to you postage paid.

Evansville Tool Works, Inc.

Evansville, Indiana

FILL IN——TEAR OFF——AND MAIL

Evansville Tool Works, Inc., Evansville, Ind.

Gentlemen—

I am enclosing my P. O. Money Order for $2.00. Please send me the No. 77 Electrician's Hammer at once.

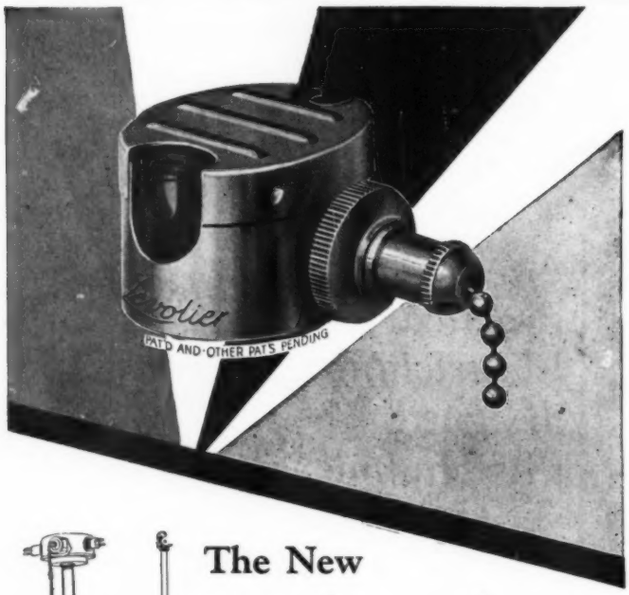
My Hardware Dealer's _____

Name and Address _____

My Name _____

Street Address _____

City _____ State _____



Used in Knock-out of Conduit Box

Ideal for Canopies

Fit Shallow Ceiling Fans

Canopies of Store and Office Fixtures

The New *Levolier* Fixture Switch

A new and bigger opportunity for the easy selling of the idea of better industrial lighting. Jobbers, dealers, contractors can tie in with the big campaigns for improved factory lighting that central stations, electrical leagues, lamp and reflector manufacturers are getting under way.

Sell the idea of individual control of the big lamp units. The new Levolier Fixture Switch will stand the wear and tear of the hardest service—even the smash of the initial surge when switching a cold 500-watt gas-filled Mazda lamp.

Just the thing for modernizing an old job and where the new installation must be cut to the bone this switch will save costs in reducing conduit run, wall switch and labor charges.

Let us send you a sample and full information. Your jobber has them in stock.

McGILL MANUFACTURING CO.
Electrical Specialties of Quality
ESTABLISHED 1904
VALPARAISO INDIANA

MARION

Wires, and Cables Cords

The highest standard in rubber and varnish cambric insulated wires, cables and cords characterizes the MARION ine, as symbolized by the eagle trademark. Our chief items are Lead Covered Parkway and High Voltage Cables, but a full line of common types is available for immediate shipment. This includes Rubber Covered (solid or stranded) Conductor, Non-metallic Sheathed Cable, Lamp Cords, Reinforced Cords, Security flex all Rubber Cord, and Telephone Wires. Special wires to order.

The line also includes:

- Weatherproof Wires
- Annunciator Wires
- Switchboard Cables
- Locomotive Cables
- Automobile Cables
- Mining Machine Cables
- Varnished Cambric Cables
- Fixture Cords
- Heater Cords
- Nitro Cords
- Office Wires
- Flame-proof Cables
- Pothead Wires
- Stove Wires
- Stage Cables
- Packing House Cables
- Brewery Cords
- Deck Cables
- Border Light Cables
- Elevator Cables
- Canvasite Cords

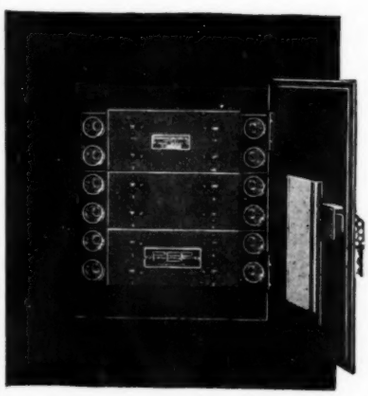
MARION INSULATED WIRE AND RUBBER CO.
Factory, Marion, Ind.

Chicago Office & Warehouse: 213-15 No. Desplaines Street.

Salt Lake City, No. 4 Interurban Bldg.
Los Angeles, 324 N. San Pedro St.
Indianapolis, Odd Fellows Bldg.
Dallas, 912 Commerce St.
Buffalo, N. Y., 395 Ellicott Square
Seattle, 95 Connecticut St.
Portland, Oregon, 355 Everett St.
San Francisco Office, 274 Brannon Street
New York, 171 Madison Avenue
Atlanta, Georgia, 515 Peters Bldg.

Good Jobs Bring More Jobs

The right Panelboard means Profit



A complete line of panelboards, switchboards, knife switches and fuse reducers that give thorough satisfaction is something that cannot be overlooked by any contractor.

Our Catalogue tells the complete story.

THE PLAINVILLE ELECTRICAL PRODUCTS CO.
PLAINVILLE, CONN.

We have now added

ADAPTiLETS

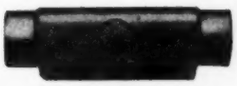
(Rigid Conduit Fittings)
to our line of

ADAPTiBOXES

(Flexible Conduit Fittings)
We can now fill orders for BOTH types. Thus you can combine both types on one order and get the benefit of a better discount

WRITE FOR CATALOG 107-A

Type LL & LR No. 8050


Type C No. 8020

No. 991

No. 990

Type T No. 8030

Type E No. 8010

Blank Covers

Type 881 and 8881

Type LB No. 8060

The ADAPTi Co.

2996 East 72nd Street,
CLEVELAND, O.

NEW YORK CITY
A. Stone, 112 East Twenty-Third Street.

PHILADELPHIA
Craven Electric Sales Company, 30 Bank Street

BOSTON
The Hastings Electric Sales Co., 42-50 Binford St.

MURLIN

A Colonial Lantern of New Design

HERE is a new small Colonial Lantern, manufactured in both Cast Iron and Cast Bronze, which has been patented by the U. S. Patent Office.

As the backplate is made in one piece, the bottom of which may be locked to an outlet box, and as the top part supports a hinged covering, it is easy to hang and to re-lamp this attractive lantern.

Send for the *New* Murlin Catalogue, No. 4-A, for illustrations of many other new and different designs.

No. 1767

Murlin Manufacturing Co.
5420 Paschall Ave.
Philadelphia, Pa.

MEMBER ARTISTIC LIGHTING EQUIPMENT ASSOCIATION
Decorate with Artistic Lighting Equipment
ART DISCRIMINATION UTILITY QUALITY REPUTATION

The Jiffy Line

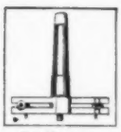
Jiffy Tools Reduce Repair Costs!

Save *time, labor* and *money* with these valuable labor-saving items.

We guarantee *your* satisfaction. Order any tool illustrated on the margin, on approval. If YOU are not satisfied return the material at our expense.

A Bulletin describing the complete line in detail will be mailed upon request. Fill in the coupon below or send in your order ON APPROVAL.

Box Cutter


Drillpress Cutter

Pipe Bender

Nipple Chuck

Solder Dipper

Paul W. Koch & Company
25 So. Wells St., Chicago

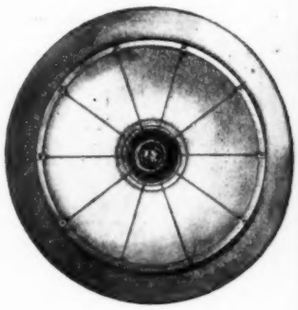
☐ Send information regarding Free Trial.
☐ Send the "JIFFY LINE" Bulletin.

Name _____
Firm _____
Street _____
Address _____

FLUSH CEILING FIXTURES

For illuminating the Gymnasium-Auditorium, Entrance Vestibules, Low Passages, etc. These fixtures are not only well protected but also highly efficient besides being neat in appearance, made of solid brass or copper, and finished to blend with the environments. Made in five sizes, 60 watt to 1000 watt capacity.

Jaehnig Lighting Fixture Co., Inc.
221-223 Thirteenth Ave.,
NEWARK, N. J.



Rubber Insulated Wires and Cables
Insulating Tapes and Splicing Compounds

Raven Core Wires
Grimshaw Tapes
Competition Tapes

New York Insulated Wire Co.

Main Office
114 Liberty Street,
New York City

Factory:
Wallingford, Conn.

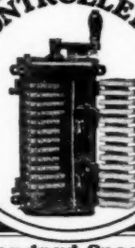
UNION DRUM

Electric Motor Control Apparatus

ALL TYPES OF D.C. MOTORS

SLIP RING SQUIRREL CAGE MULTI SPEED A.C. MOTORS

CONTROLLERS



Union Electric Mfg. Co.
Milwaukee, Wis.
Offices in all Principal Cities

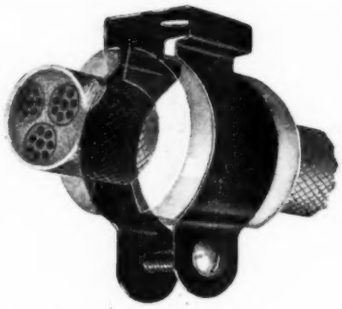
Standard-Special Explosion Proof For all Purposes A.C-D.C.

CRANES HOISTS TRUCKS TRACTORS METAL AND WOOD MACHINERY OIL FIELD AND REFINERY APPLICATIONS

Without Bushing

Minerallac Cable and Conduit Hangers

From 3/8 to 2 1/2 inches.



A Time Saver -- Reliable -- Only one hole to drill

DISTRICT REPRESENTATIVES

A. D. Fishel Co.	944 Engineers Bldg.	Cleveland, Ohio
Robert H. Anthony	261 Franklin Street	Boston, Mass.
Henry Muller Co.	First National Bank Building	Pittsburgh, Pa.
Electrical Engineering Sales Co.	502 Delta Building	Los Angeles, Calif.
George W. Snarr	110 So. 9th Street	St. Louis, Mo.
P. T. Bradley	Guaranty Industrial Building	Philadelphia, Pa.
J. E. Sumpter Co.	Security Building	Minneapolis, Minn.
Al. Dusseau	526 Detroit Savings Bank Building	Detroit, Mich.
Chas. L. Ward Co.,	Room 701 Midland Building	Kansas City, Mo.
Public Service Supply Co.	Room 621 Union Trust Building	Cleveland, Ohio
S. A. Weiss & Co.	Room 510, 342 Madison Avenue	New York, N. Y.

MINERALLAC ELECTRIC COMPANY

25 N. Peoria Street **Chicago, Illinois**

MOHAWK

Dependable

Contractors enjoy handling a product that is reliable and dependable; they have accepted Mohawk Conduit because it measures up to their standards. That is why you see Mohawk going into the big jobs.

INDIAN WHITE

INDIAN BLACK

Smooth finish; tough, glossy enamel. ¶ Pipe bends so easily you hardly realize it is steel. ¶ Clean, even threads that make work a joy.

Mohawk may be had in either *Indian Black* (enamel) or *Indian White* (galvanized). Ask your jobber or your nearest Mohawk Conduit Company branch.

MOHAWK CONDUIT CO., *Inc.*

COHOES, NEW YORK

BRANCH OFFICES: CLEVELAND - ST. LOUIS - SAN FRANCISCO
NEW YORK - CHICAGO - DENVER - LOS ANGELES
SEATTLE - BOSTON - NEW ORLEANS

Permaflector

Free Engineering Service

For Special Displays

For your special displays this Permaflector Windo-Spot No. 200 is the thing. Takes 200-watt lamp. Every merchant needs at least one Windo-Spot—larger stores have use for several. Price of the No. 200, $10; with Colorlite, $12.50; portable base, $1.25 extra. All quotations F.O.B. Irwin, Pa.

"Pittsburgh" Permaflector

LET our engineering department study your show-window lighting problems and offer suggestions. No obligation on your part. Permaflector quality and service insure satisfaction for every merchant for whom you make installations. That means *more business for you.*

For twenty years we have specialized in show window and sales display lighting. All Permaflectors carry the 10-year guarantee, based upon an unequalled record of manufacturing excellence. In more than 12 years, less than one-thousandth of one per cent of our reflectors have been reported to us as having the backing tarnish or darken. That is mighty near perfect. Use that record to your own profit.

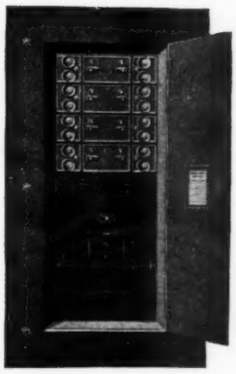
PITTSBURGH REFLECTOR COMPANY
304 Ross Street, Pittsburgh, Pa. *Representatives in 26 Leading Cities*

The New SQUARE D Panelboard....

... LIGHTER

... SMALLER

MANY NEW AND EXCLUSIVE FEATURES



With Main Switch Single Door

With Main Fuses Door-in-Door

With Lugs in Mains Single Door

Designed and Built to SQUARE D Standards

Square D has spared neither time nor engineering expense to make this new line of panelboards worthy of the Square D name—in appearance, serviceability, durability, safety, value.

They are less bulky than previous types of panelboard—and lighter by far. Yet innumerable construction features show what extraordinary attention has been paid to strength and capacity for *heavy duty*.

Among the outstanding features, exclusive with Square D, is the use of genuine Bakelite, in walnut color, for all molded parts, 21 in number. Circuits, too, are designated with Bakelite numbering buttons.

Main switches of 60, 100 and 200 ampere capacity are of the Square D improved brush type with exceptionally quick break—a new and exclusive design.

Handles and panel trim adjusting screws are all chromium plated—another exclusive feature—as is the use of olive green dull finish on the standard trim. All metal parts are rust proofed.

Another unusual feature, of great advantage in industrial use, is that plug fuses and cartridge fuses are interchangeable—you need only remove the plug fuse section and replace it with one designed to hold cartridge fuses. This may be accomplished without removing the panel from the cabinet.

These are but a few of the "high points" of design and construction that make Square D panelboards outstanding products in their field. The number of box sizes needed have been reduced—yet the line is *complete*—meeting every requirement of industrial service.

Jobber representatives and Square D district managers will gladly submit quotations and give any desired information.

SQUARE D COMPANY, DETROIT, U. S. A.

FACTORIES AT: DETROIT, MICH., PERU, IND.

BRANCH OFFICES
Boston — New York
Philadelphia — Baltimore
Richmond — Atlanta
Birmingham — Syracuse
Buffalo — Pittsburgh
Grand Rapids — Cleveland

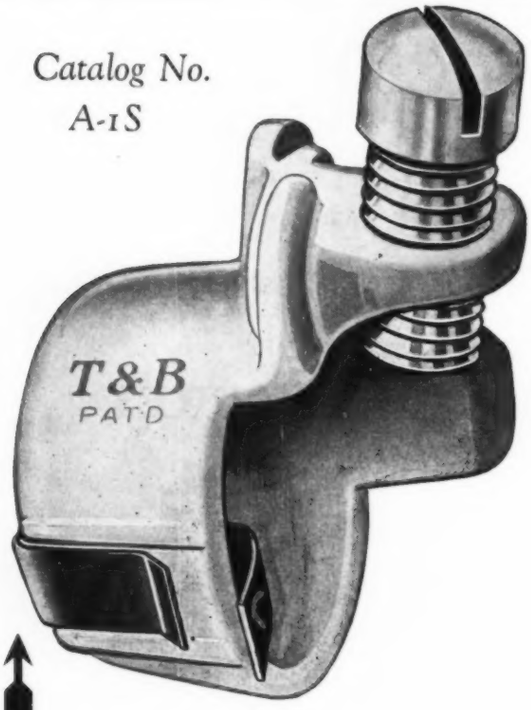
SQUARE D

ELECTRICAL EQUIPMENT

BRANCH OFFICES
Cincinnati — Chicago
Milwaukee — Minneapolis
Indianapolis — St. Louis
Kansas City — Dallas
Denver — Los Angeles
San Francisco — Portland

(133)

Catalog No.
A-1S



The Steel Spring

It Snaps in—

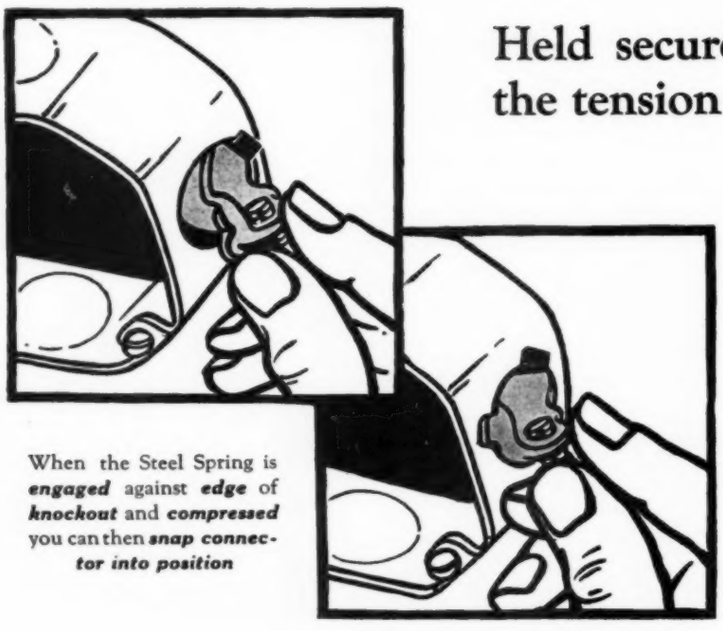
that's why it can't fall out!

The New "Spring" Type

T&B "Slip-In" TRADE MARK

3/8" BOX CONNECTOR

Approved by National Board.



When the Steel Spring is ***engaged*** against ***edge*** of ***knockout*** and ***compressed*** you can then ***snap connector into position***

Held securely in knockout by the tension of the steel spring

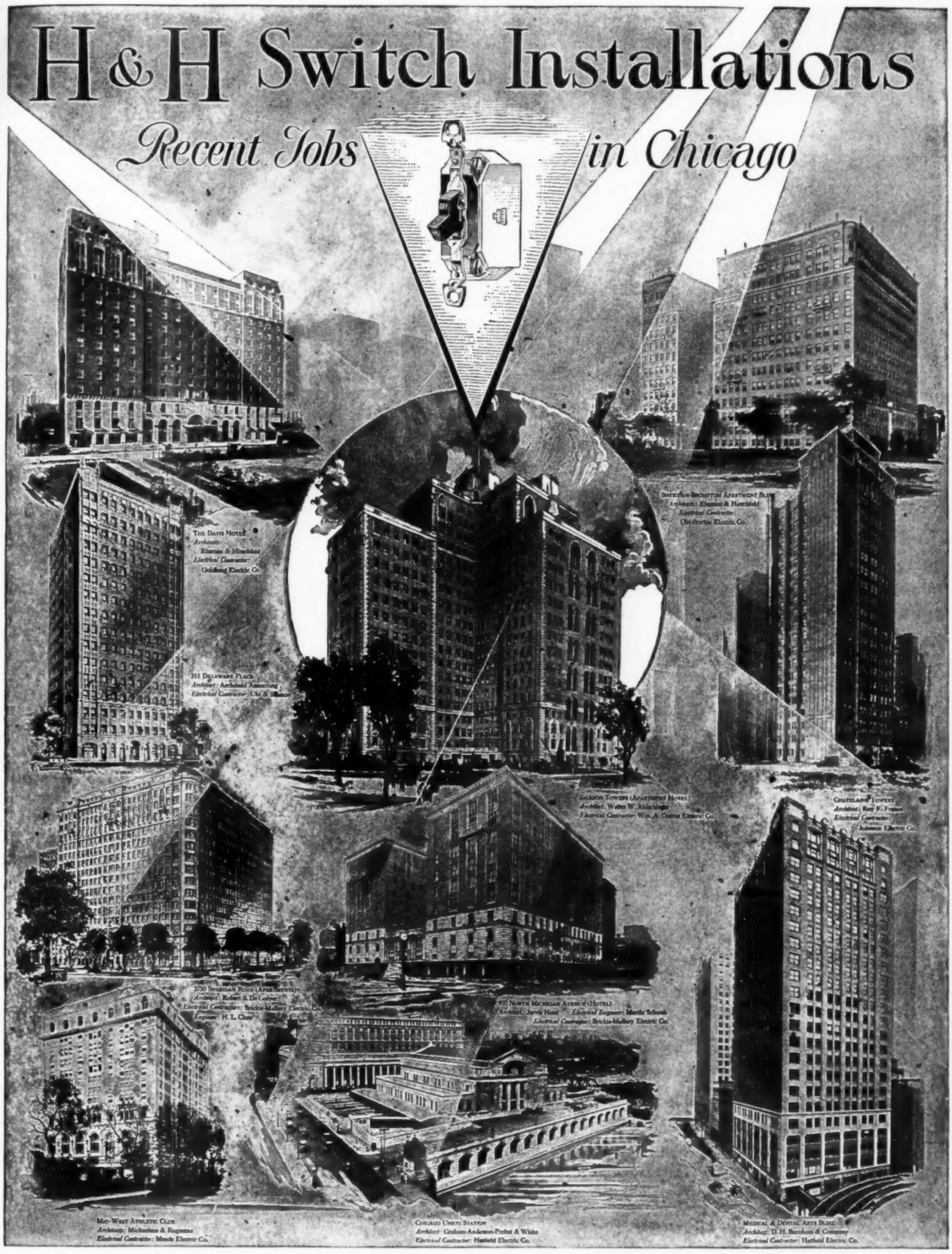
1—Sold assembled-ready for use.
2—Makes a perfect ground.
3—Can't fall out.
4—Saves time and money.

The "T & B" *"Slip-In"* Connector is designed to take No. 14W2, 14W3 and 14-C, 14-P Cord

THE THOMAS & BETTS CO.
15 PARK PLACE NEW YORK, N.Y.

H & H Switch Installations

Recent Jobs in Chicago

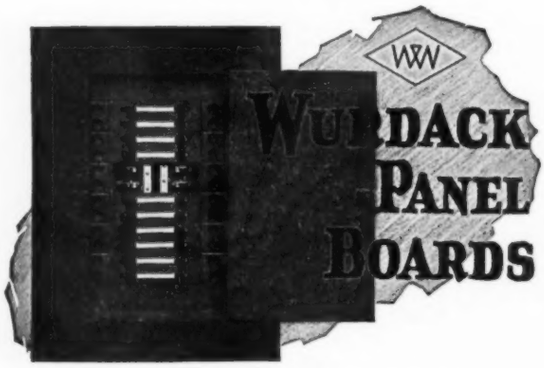

THE DAVIS HOTEL
Architects: Rissman & Hirschfield
Electrical Contractor: Goldberg Electric Co.
SHERIDAN-BROMPTON APARTMENT BLDG.
Architects: Rissman & Hirschfield
Electrical Contractor: Old-Brickle Electric Co.
701 DELAWARE PLACE
Architect: Archibald Armstrong
Electrical Contractor: Uhl & Hinson
JACKSON TOWERS (APARTMENT HOTEL)
Architect: Walter W. Ahlschlager
Electrical Contractor: Wm. A. Custer Electric Co.
CHATELAINE TOWERS
Architect: Roy F. France
Electrical Contractor: Johnson Electric Co.
3750 SHERIDAN ROAD (APARTMENTS)
Architect: Robert S. De Golyer
Electrical Contractors: Brickle-Mallory Electric Co.
Engineer: H. L. Cl...
900 NORTH MICHIGAN AVENUE (HOTEL)
Architect: Jarvis Hunt
Electrical Engineer: Martin Schwab
Electrical Contractor: Brickle-Mallory Electric Co.
MID-WEST ATHLETIC CLUB
Architects: Michaelsen & Rognstad
Electrical Contractor: Meade Electric Co.
CHICAGO UNION STATION
Architect: Graham-Anderson-Probst & White
Electrical Contractor: Hatfield Electric Co.
MEDICAL & DENTAL ARTS BLDG.
Architect: D. H. Burnham & Company
Electrical Contractor: Hatfield Electric Co.

THE HART & HEGEMAN MFG. CO.

HARTFORD, CONN. MAKERS OF ELECTRIC SWITCHES SINCE 1890

EXPECT GREAT THINGS

in the improved sectional type



They will measure up to your expectations

Inbuilt quality and superior design have always characterized Wurdack Panel Boards. But these improved sectional panels, with their many advanced features, set a new standard in panelboard construction. Consider these outstanding features:

- All parts are removable from the front. Ready access is provided to switch mechanism and fuse connections. It is especially easy to replace copper shell or contactor screw when these become badly burned from short circuit or heavy overload.
- All new tumbler switches are rated 30 ampere, 250 volts and are heavy duty type, with mechanism and contact parts capable of most severe service. Single pole tumbler switches are equipped with Bakelite arc snuffers lengthening life and increasing breaking capacity. Blades are self aligning with contacts. The entire steel frame and switch mechanism is thoroughly rust-proofed.
- Entire back of sectional panel is covered with a continuous steel plate, which guards against injury during installation, and always keeps mechanism of switches free from dust and dirt.
- Panel is secured in cabinet by means of four special mounting studs, which permit adjustment both in-and-out and laterally. The arrangement is such that adjustment can be made after panel is installed without the use of any special tools.
- All-steel fronts, of heavy guage sheet, are smooth and flat and carefully finished in genuine black lacquer. Easy to keep clean and neat in appearance.

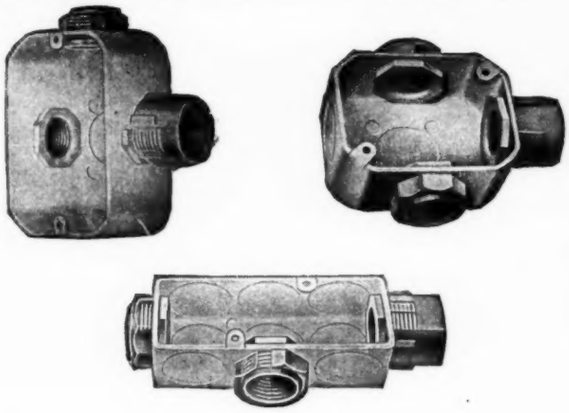
Assure satisfaction to both your client and yourself by installing Wurdack Panel Boards on your next job. Investigate their merits . . . Write for latest catalog.

WM WURDACK ELECTRIC MFG. CO.

4444 CLAYTON AVE., ST. LOUIS, MO.

"STEEL CITY"

Wirelets



Wirelet conduit bodies are made in three types and eliminate the necessity of using castings designed for each condition. By using Wirelets you have less stock to contend with and get the maximum of flexibility, as thousands of combinations are met with three bodies and two couplings. Wirelets take all standard wiring devices and are furnished with covers of all types.

Wirelet Couplings rigidly connect the conduit to the Wirelet Body. Made in two sizes, one for ½" conduit and the other for ¾" conduit. Both couplings fit the one size of knockout used throughout the three Wirelet Bodies.

Covers can be furnished to take any standard wiring device.

USE WIRELETS FOR GREATER ECONOMY

They reduce your stock investment and increase your profits by saving in time of your wiremen.

Manufactured by

Steel City Electric Co.

PITTSBURGH, PA.

Type "A"
Rectangular Unilet with Three-Wire Porcelain Cover

Type "C"
Rectangular Unilet with Rectangular Porcelain Receptacle

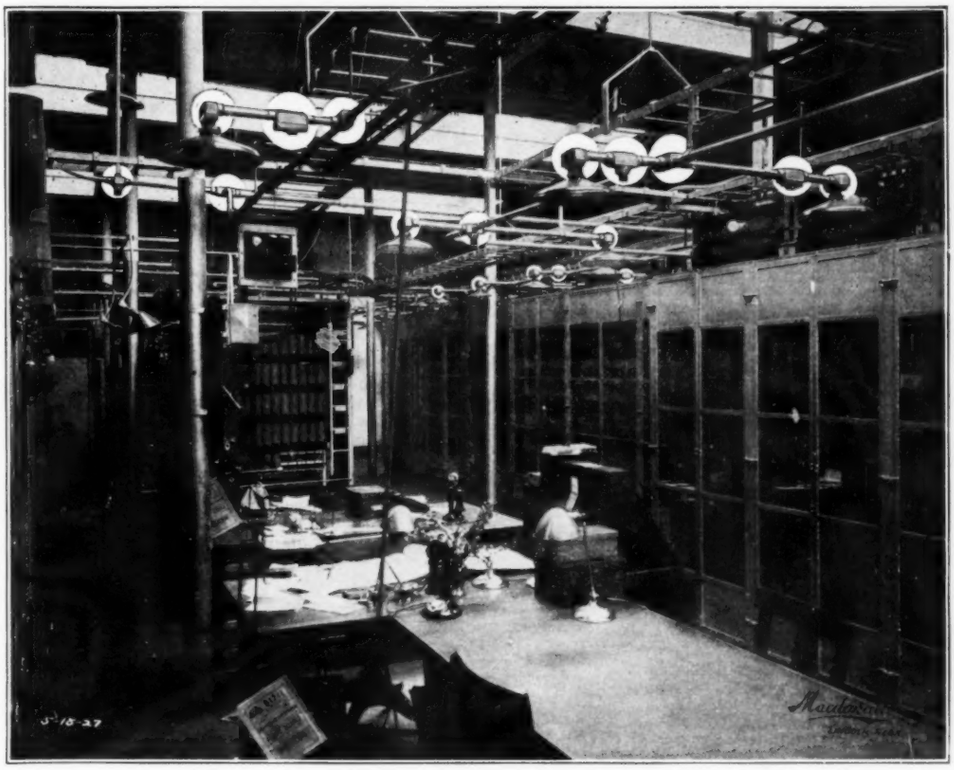
Type "LL"
Rectangular Unilet with Blank Metal Cover

Type "LR"
Rectangular Unilet with Cord Rosette

Type "T"
Rectangular Unilet with Plug Receptacle

Type "GSC" Unilet with Operating Handle for Snap Switches

Type "FS" Unilet with Cover for Plug Receptacle



As used by the Lincoln Telephone & Telegraph Co., Lincoln, Nebraska.

Appleton Unilets Mean Speed —Economy—Satisfaction

On any wiring job Appleton Unilets live up to a proven high standard. Their sizes are accurate, the bottoms are flat and true, with a maximum of wiring space available in all types. The great variety of shapes and sizes in which Appleton Unilets are made insures the greatest speed in installing, for there's just the right fitting for any wiring need.

Contractors everywhere turn to Appleton Unilets for thorough satisfaction on wiring jobs. They know the reputation these conduit fittings have on all types of construction the country over—and they know that there's a Threaded, or No-Thread Unilet for every purpose. Whether you're using them, or not, drop us a card for our latest catalogue. You'll find it valuable—and there's no obligation.

APPLETON ELECTRIC COMPANY
1704 *Wellington Avenue* • *Chicago, U. S. A.*
New York—150 Varick Street Los Angeles—340 Azusa Street

APPLETON UNILETS *and* **CONDUIT FITTINGS**
STANDARD FOR BETTER WIRING

NUMBER 5691

Here is a 3-light fixture of good design and excellent workmanship that you can sell

This is typical of the fixtures listed in the new Beardslee "Bulletin S". We have grouped in this Bulletin a number of popular designs in Flemish Brass and Scoured Iron which because of large production can be very moderately priced.

Designs are attractive and distinctive and materials are right up to the Beardslee standard.

Shipment on any of the fixtures listed in "Bulletin S" can be made in 24 hours, or less, after receipt of your order.

Beardslee Chandelier Mfg. Co.
231 South Jefferson Street,
CHICAGO

A·L·E·A

American Steel & Wire Company

Graham, Anderson, Probst & White, Chicago—*Architects*
John Gill & Sons, Cleveland—*General Contractors*
Hatfield Electric Co., Chicago—*Electrical Contractors*

The TERMINAL TOWER Building Cleveland, Ohio

Wired with

ASW 30% Wire

The new Cleveland Terminal Tower Building just opening its doors to serve the traveling public, adds another great testimonial, to the quality and service of ASW 30% Wire, with which it is wired.

It is becoming more generally conceded by engineers every day that specifying American Steel & Wire Company Wire is the best insurance of a dependable and lasting wiring system—and on every hand you see the increasing use of this wire in America's great new buildings.

Let us send you our indexed catalogue and handbook of electrical wires and cables. Estimates furnished promptly from any of our offices in all the principal cities.

SALES OFFICES

CHICAGO	208 So. La Salle Street	NEW YORK	30 Church Street
CLEVELAND	Rockefeller Building	BOSTON	Statler Building
DETROIT	Foot of First Street	PITTSBURGH	Frick Building
CINCINNATI	Union Trust Building	PHILADELPHIA	Widener Building
MINNEAPOLIS—ST. PAUL	Merchants Nat'l Bank Bldg., St. Paul	ATLANTA	101 Marietta Street
		WORCESTER	94 Grove Street
ST. LOUIS	506 Olive Street	BALTIMORE	22 So. Charles St.
KANSAS CITY	417 Grand Avenue	BUFFALO	670 Ellicott Street
OKLAHOMA CITY	First Nat'l Bank Bldg.	WILKES-BARRE	Miners Bank Bldg.
BIRMINGHAM	Brown-Marx Bldg.	*SAN FRANCISCO	Russ Bldg.
MEMPHIS	Union and Planters Bank Bldg.	*LOS ANGELES	2087 E. Slauson Ave.
DALLAS	Praetorian Bldg.	*PORTLAND	777 Nicolai St.
DENVER	First National Bank Bldg.	*SEATTLE	4th Ave. So., & Conn. St.
SALT LAKE CITY	Walker Bank Bldg.	*United States Steel Products Company	

The Mark CST of Quality

The

ELECTRICAL DIVISION

of the

Chicago Steel Tank Co.

will supply your conduit fitting requirements satisfactorily. When ordering from your jobber, specify CST products, thereby assuring yourself of the highest grade workmanship and material.

Leading Jobbers everywhere stock the STEEL TANK Line.

THE STEEL TANK LINE:

Lock nuts ⅛" to 6". Bushings ⅜" to 6".
Armored Cable Connectors ¼" to 2".
Set screw. Squeeze. 45° angle. 90° angle.
Conduit Nipples ⅜" to 3".
Double Female Hickeys.
Extension Pieces.
Fixture Studs.
One Hole (Heavy Steel) Pipe Straps.

Satisfaction Guaranteed

Each locknut, bushing, connector and every other item is absolutely guaranteed. Every piece is as perfect as modern up-to-the-minute automatic machinery can make it. Perfect threads and careful galvanizing make an absolutely satisfactory product. Any piece defective in workmanship or material will be replaced without cost.

CST Fittings were formerly manufactured for other manufacturers and sold under their trade names.

Chicago Steel Tank Co.

ELECTRICAL DIVISION

6400 West 66th Street, Chicago

32 Union Square
New York City

1321 Arch Street
Philadelphia

Boston Detroit St. Louis Dallas
Minneapolis Cleveland San Francisco

Lights

The Denver Gas & Electric Building, Denver, Colo.
The best lighted building in the world.

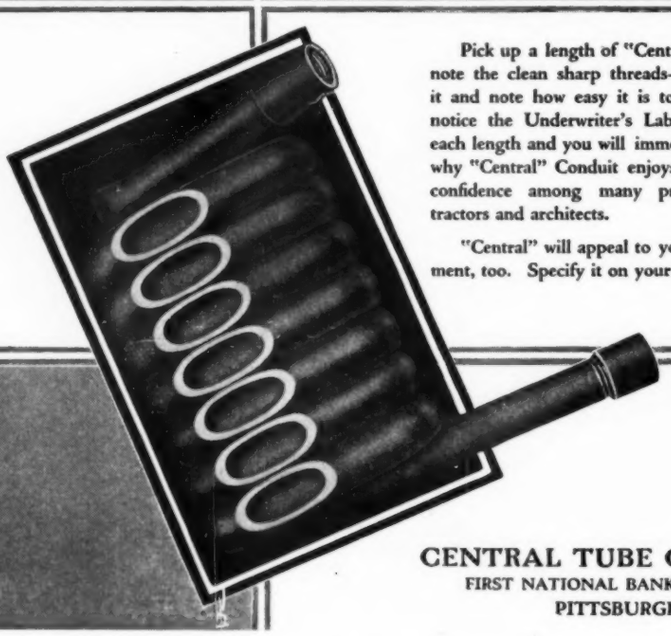
Architects: F. E. Edbrooke Architect Co., Denver.
Electrical Contractor, J. Fischer, Denver.

Whether the lights are for stage settings, display or illuminating purposes, the conduit that carries the network of wires must have lasting qualities and conform with the specifications of the Underwriters' Code.

When you install rigid conduit be sure you use only the best, "GALVADUCT" and "LORICATED."

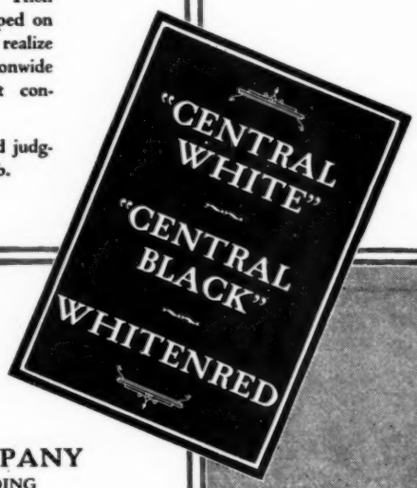
GARLAND
Manufacturing Co.
Pittsburgh, Pennsylvania

CENTRAL CONDUIT



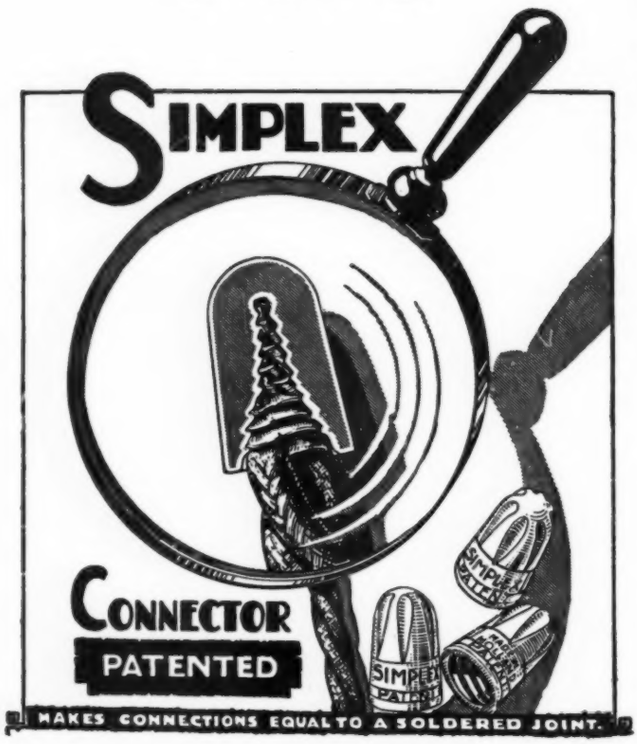
Pick up a length of "Central" Conduit—note the clean sharp threads—cut it, thread it and note how easy it is to work. Then notice the Underwriter's Label stamped on each length and you will immediately realize why "Central" Conduit enjoys a nationwide confidence among many prominent contractors and architects.

"Central" will appeal to your good judgment, too. Specify it on your next job.



CENTRAL TUBE COMPANY
FIRST NATIONAL BANK BUILDING
PITTSBURGH

625 HOURS of Constant Vibration had no effect on the "GRIP" of the SIMPLEX



When we say note the "double bulldog grip" of the SIMPLEX solderless connector, we are being conservative. After a complete test by the Electrical Testing Laboratories they report:

"After 625 hours of test no effect due to vibration could be noted on the 'grip' of the connectors."

Write for samples and test them yourself.

SIMPLEX
"A twist of the wrist"
Trade Mark, Reg.

WEISS & BIHELLER, Inc.
Importers Lighting Glassware, Crystal Fixtures, etc.
584 Broadway, New York, N. Y.
Canada—32 Front St., W., Toronto
Pacific Coast Representatives: Braun-Steeple Co., 1088 Howard Street, San Francisco, Calif.

MURRAY
METER SERVICE SWITCHES

Meter switches, like all other products if they are to keep pace with 20th century progress, cannot stand still but must be improved continually. That is why you will find MURRAY METER SERVICE SWITCHES constantly being improved to make them better for the contractor.

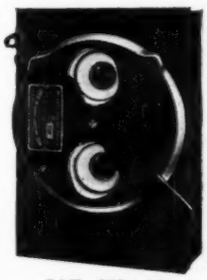
There are no yearly models, but each improvement as it is perfected is quickly placed in production.

Inspect the new thirty ampere two fuse MURRAY AA ROTARY (Accessible Main Fuses) for two and three wire services. It has the following features:

1—New Handle for easier operation.

2—New cutout for still easier wiring.

3—New cover catch which is extremely simple and very efficient.



CAT. NO. 756
3W-125-250 Volt,
2 Fuses—SN.

"EASY WIRING"
IS CHARACTERISTIC OF
EVERY MURRAY SWITCH

Send For Catalog Today!

METROPOLITAN
DEVICE CORPORATION
1250 ATLANTIC AVENUE
BROOKLYN · NEW YORK

CHICAGO
BOSTON
PITTSBURGH
PHILADELPHIA
ST. LOUIS
ATLANTA
DALLAS
DETROIT
SEATTLE
MINNEAPOLIS

LESS LABOR AND GREATER PROFITS IF YOU WILL—

—Depend upon **"TOLEDO"** conduit tools and dies for threading electrical conduit.

These new **"TOLEDO"** tools are made in two models, the No. 11 ratchet tool, capacity ½" to 1¼" conduit, the No. 31 three-way tool, capacity ½", ¾", and 1" conduit. They are equipped with special dies that cut smooth, straight threads with only a short taper at the base, permitting butted joints so necessary for the perfect conduit job. They cut with surprising ease, far easier than ordinary threading tools and produce perfect results. The No. 11 tool complete will cost you but **$12.00** net, (West of Rockies **$13.20** net). The No. 31 will cost you but **$9.00** net, (West of Rockies **$9.90** net) all F. O. B. Toledo or your dealer's stock.

NO BETTER TOOLS MADE THAN
"TOLEDO"

THE TOLEDO PIPE THREADING MACHINE CO.
Toledo, Ohio

NEW YORK OFFICE,
72 LAFAYETTE STREET

MAIL THIS COUPON TO US TODAY
PLEASE TELL ME ABOUT "TOLEDO" ELECTRIC CONDUIT DIES.
Name.....
Street.....
City.....
State.....

E

RELIANCE TIME SWITCHES

have been on the market for 19 years and are made in 12 different types to meet every purpose.

APPROVED AND GUARANTEED
HANDLED BY JOBBERS

We also make
RACINE TIME SWITCHES

A low priced machine that will meet the strongest competition.

RELIANCE AUTOMATIC LIGHTING CO.

1936 Mead Street RACINE, WISC.

That's why TRICO

VISIBLE LINK—
SHOCK PROOF
PORCELAIN TOP—
HEAVY SCREW
SHELL AND LARGE
CENTER CONTACT

"CLEAR-TOP"

WILL ADD QUICKLY TO YOUR PROFITS. FUSES

THEIR TURN-OVER IS RAPID AND CONSTANT.

Ask for this 5 unit carton of free samples. See for yourself the wonderful quality. Then you'll know why they are in the spotlight.

TRICO FUSE MFG. CO.
1001 McKinley Avenue,
Milwaukee, Wis.

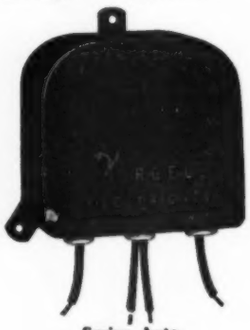
FOR
ECONOMICAL INSTALLATION
AND EFFICIENT

STREET LIGHTING

USE

SORGEL SERIES TRANSFORMERS

Made in various types for overhead construction and underground systems.



Series Auto Transformer

Series Insulating Transformer

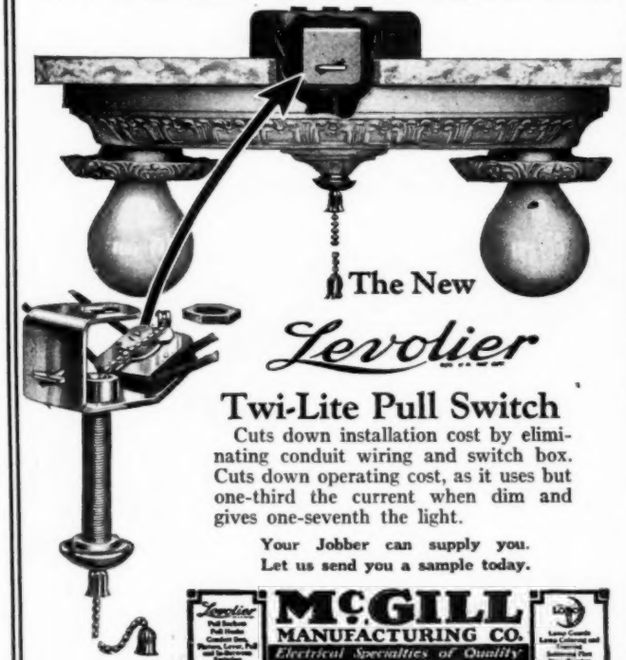
Write for Prices

SORGEL ELECTRIC CO.

Clybourne and West Water Sts., MILWAUKEE, WIS.

DIM-BRIGHT-OFF

The new Levolier Twi-Lite Pull Switch brings a new convenience, a new comfort and a new economy in the individual control of ceiling light. Ideal wherever dim lights are desired.



The New *Levolier*

Twi-Lite Pull Switch

Cuts down installation cost by eliminating conduit wiring and switch box. Cuts down operating cost, as it uses but one-third the current when dim and gives one-seventh the light.

Your Jobber can supply you.
Let us send you a sample today.

McGILL MANUFACTURING CO.
Electrical Specialties of Quality
ESTABLISHED 1904
VALPARAISO · INDIANA

Everybody agrees that fuses are indispensable to the electrical in... and very nearly everybody agrees that ... is indispensable to fuses. Not ... nsider how long D & W h... A lot can be learned ... learned it. So ... ts, the ... and th... that ... trust is ... ormance. ... every kind ... & W Fuses ... over valuable ... tus, lighting cir- ... nsable things.... ... isfaction of many an ... hatever is worth pro- te... g with D & W Fuses.

D&W FUSES are among the 60,000 items distributed by Graybar

OFFICES IN 70 PRINCIPAL CITIES
EXECUTIVE OFFICES: GRAYBAR BLDG., LEXINGTON AVE. AND 43rd STREET, NEW YORK CITY

More Speed—Less Work!

EVERY job in quicker time! Easiest fishing you ever knew. And complete thread protection; 3-lug metal cap cushioned with fibre—protects entire thread. Pittsburgh Standard Conduit reaches the job ready to install.

Enameled Metals Company
PITTSBURGH, PA.

"Glad We Discovered You"

—writes a satisfied Electragist.

And that's the way you will feel, too, after you have had a "taste" of **BELSON SERVICE** on any job —be it big or little.

BELSON EQUIPMENT

Floodlights	Louvrelights
Footlights	Covelights
Spotlights	Exit Signs
Borderlights	Sign Lights
Striplights	Etc. Etc.

All built from better materials than are commonly used; with better workmanship and embodying important improvements in design that make installation simpler and maintenance less costly.

Better Co-operation

You'll like the way we "put ourselves in your place" and the intelligence with which we make your problems our own.

Put us on your Inquiry Lists

so that you will be sure to get our quotations on all requirements.

Send for our Bulletins.

BELSON MFG. CO.
808 Sibley Street, Chicago, U. S. A.

Universally Adaptable
IDEAL
UNIVERSAL WIRE CONNECTORS

One size fits all common wiring joints.

Lower prices.

Current carrying spring insert, instead of insulating material, contacts all wires and insures lasting electrical as well as mechanical joints.

Unbreakable.

Ask for sample and new low prices.

IDEAL COMMUTATOR DRESSER CO.
1041 Park Ave., Sycamore, Ill.

Ideal Commutator Dresser Co.
1041 Park Ave., Sycamore, Ill.

Please send sample and complete information regarding Ideal Universal Wire Connectors.

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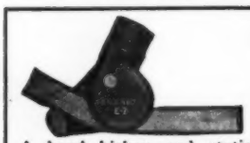

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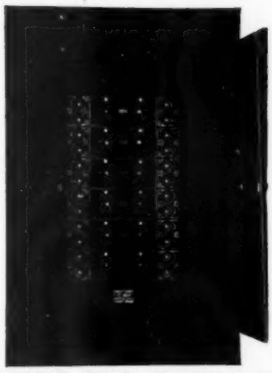

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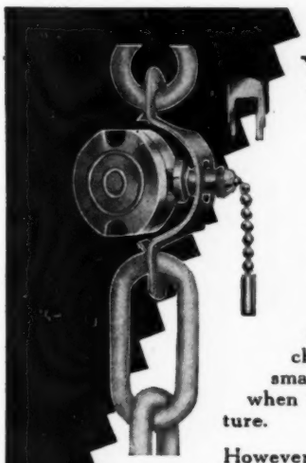

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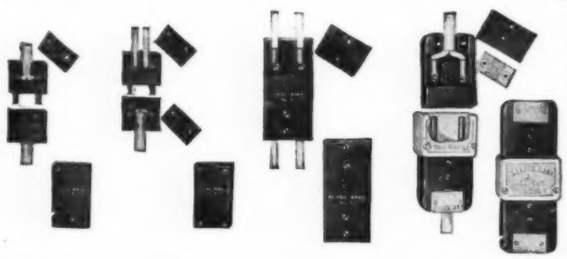

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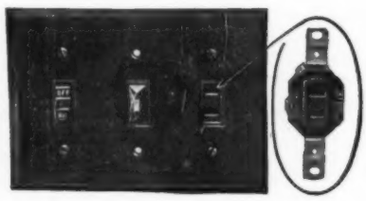

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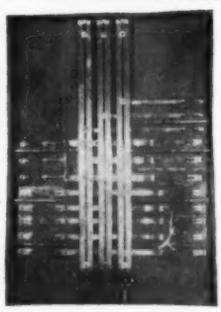

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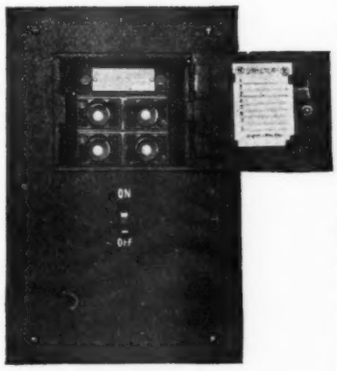

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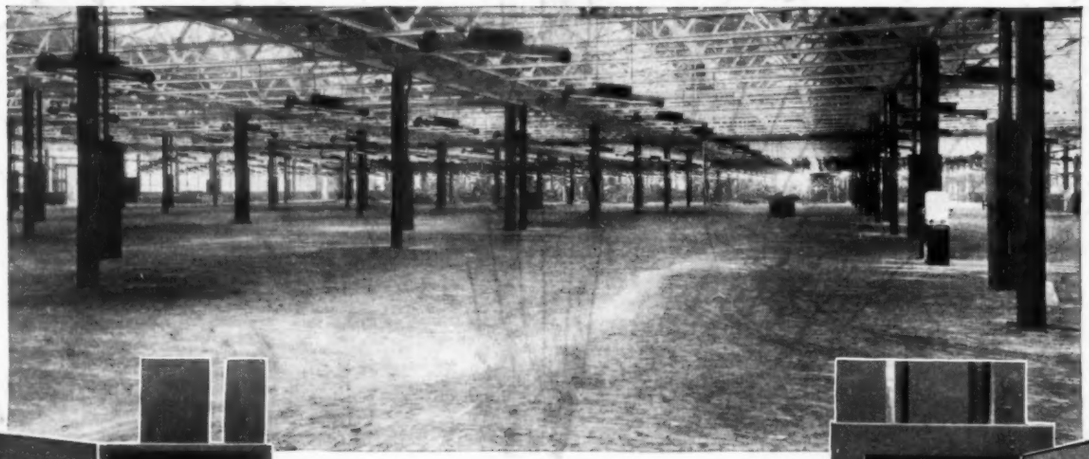

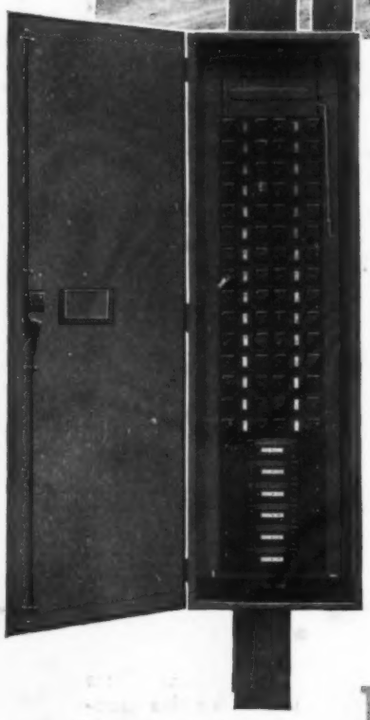

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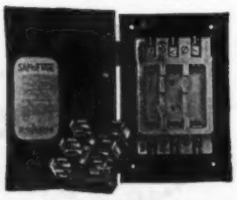

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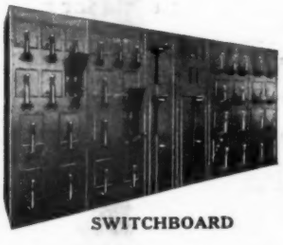
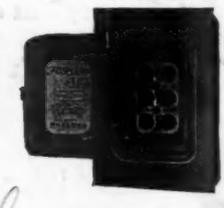


SWITCHBOARD

PANELBOARD



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